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How the Electrical Work of the Navy is Superintended.

Lieut. R. M. Doyle, of the Navy, has been ordered to Cramp & Sons ship-yard, at Philadelphia, to familiarize himself with the electric lighting apparatus on the "Baltimore," which will be under his supervision when the vessel goes to sea. Lieut. James H. Glennon is on the same duty on the "Charleston," at San Francisco. The electric appliances on the naval cruisers have come to be so extensive and important that an officer with considerable knowledge of their construction and operations is required to supervise them, and, in order to meet this demand, officers who have made a special study of electrical science are given the opportunity of mastering the practical details of the business.

All the electrical matters in the Navy, which have heretofore been distributed among various bureaus in the department, are now under the management of Commander R. B. Bradford, whose office has been transferred from the Bureau of Navigation to the Bureau of Equipment and Recruiting. Commander Bradford has as his assistants, in the Department at Washington, Lieut. T. E. DeWitt Vedder, Ensign Gilbert Wilkes, a grandson of Admiral Wilkes, and J. W. Crawford, formerly with the Edison Company, as expert aid. Lieut A. W. Grant is stationed at the Union Iron Works, San Francisco; Ensign Geo. R. Clark, at Chester, Pa.; Ensign Stokely Morgan, at Cramp & Sons, Philadelphia, and Lieut. Lucian Flynne at the Norfolk Navy Yard, to superintend all electric work on vessels under construction at these places.

Photographing a Flying Rifle Bullet by Electricity.

Photographs of the interior of the gun are taken by means of the electric light, and the information obtained by these means is most valuable, and is manifestly more satisfactory than that given by the method of taking impressions of the bore in soft rubber. Photography has also been made use of in studying the motion of the projectile. In the case of large guns instantaneous views of the shot during its flight have been successfully taken by means of a camera provided with a quick-acting shutter. This method is not applicable, however, to small arms. A rifle bullet is a very small object, and the camera must be set very near its path in order to obtain a picture of sufficient size to be of use; but the nearer the instrument is placed to the moving object to be photographed the more rapid is the motion of the image over the plate, and no "instantaneous" or quick-acting shutter could possibly be made to operate with sufficient rapidity, or at the proper instant, to give a sharply defined picture. The desired end is accomplished, however, by the aid of electricity. The camera is provided with an extremely sensitive plate and placed in a dark room, through which the bullet is made to pass. The instant the bullet is in front of the camera it breaks an electric circuit, producing a spark which illuminates the bullet for an instant, and its image is impressed upon the sensitive plate. The duration of the electric spark is almost infinitesimal, and since the plate is affected only during the continuance of the spark, a well-defined photograph of an object moving at a greater velocity than that of sound is obtained. Such pictures show the condensations of the air in front of the bullet, the vacuum behind it, and the eddies and currents produced in the surrounding atmosphere by its motion; and they afford information which is of value in determining the best shape to be given to the projectile in order to reduce to a minimum the resistance which the air opposes to its flight, and so increase its range and effect.

Electricity in the Heart's Beats.

Dr. Augustus Waller, of the hospital schools, has recently made a number of experiments showing that it is possible to detect, by existing electrical instruments, the electric currents generated at each beat of the heart. Two people holding each other by the hand, and connected by a capillary electrometer, give evidence of electrical shocks through each other. The hands of a single subject, dipped into two basins of water in connection with the electrometer, give a deflection of the instrument at every beat of the pulse.

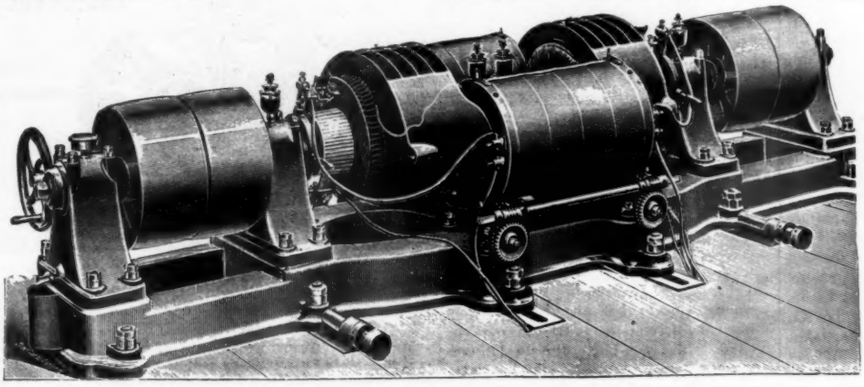


FIG. 1.—THE NEW DYNAMO OF MARCEL DEPREZ.

A Strong Construction Company.

Mr. John A. Seely, for many years electrician of the Metropolitan Telephone and Telegraph Company, of New York City, has resigned to devote his time almost exclusively to electrical construction, a field where there is a growing demand for competent men. Mr. Seely will be consulted by the telephone company concerning the details of its work with which he is most familiar, but with that exception will devote himself entirely to the newly reorganized Complete Electric Construction Company, 14 Cortlandt street, of which he is general manager. Mr. H. K. Thurbur, the well-known capitalist, is president of the company, Mr. Henry E. Hawley, vice-president, and Mr. James A. Taylor, secretary and treasurer. This company, with plenty of capital and an experienced and skillful electrician as its general manager, will at once take leading rank in its field, and will deserve and no doubt receive a warm welcome from the lighting and other companies needing first-class electrical construction. Such work should always be done by competent and responsible persons, and both these elements are comprised in the Complete Construction Company under its present management.

Some of the recent work done by this company consist of the installation of 500 incandescent lamps, alternating system, in the Newark, N. J., public library, the current to be furnished by the local lighting company; a plant of 25 arc and 30 incandescent lights for the Ellingwood Steel Mill, using the Continental dynamo, and 1,000 lights for the U. S. Electric Lighting Company.

Drop in a Nickel and Talk Over the Telephone.

The New York and New Jersey Telephone Company has about completed a slot-telephone machine, which will put the possessor of a nickel or some convenient piece of silver in communication with any part of the city. The superintendent of the company stated that the plan is a perfectly feasible one, and he thought it surprising that some one had not thought of it before. The machine will be put up at all the elevated stations and places of public resort. The prices and other directions will be indicated on the sounding board, so that the manipulator will not be at all at a loss how to proceed. As the coin goes through the aperture the central office will be rung up and connection made with the party wanted, as in ordinary cases.

An Opinion of a Contemporary.

THE ELECTRICAL REVIEW, a New York journal devoted to the spreading of reliable information relating to electrical matters, is a paper that should find its way to the masses who seek knowledge on a subject that is becoming more important every day. There is little excuse for any person of intelligence to remain ignorant of the various means that are employed to utilize electricity in the production of light and the conveyance of power. In the arts, too, the use of the subtle fluid has attained a foothold that cannot be dispensed with, and every child should be taught to know its uses and mode of application. H. W. Doolittle, of this city, a son of Mr. T. B. Doolittle, is a terse and brilliant writer on the REVIEW.—*Bridgeport (Conn.) Standard.*

—— All of the streets in the city of Montreal are now illuminated by the electric light.

The Marcel Deprez Dynamo at the Paris Exhibition.

We extract the following from our London contemporary, *Industries:*

"Three systems of distribution are adopted at the central station which adjoins the Machinery Hall. One distribution is at 75 volts, another at 115 volts, and the third at 600 volts. On the first circuit there are mounted those arc lamps which are fixed in the neighborhood of the station, and which must be independently lighted and extinguished. These are arranged in simple parallel. The second circuit serves for incandescent lighting, and on the third circuit of 600 volts are placed those arc lamps which are distributed over a wider area, and those are arranged 12 in series. Fig. 1 is a view of one of these machines. It will be seen that the machine consists in reality of two dynamos having a common set of field magnets. The latter have circular cores, which are placed horizontally, their pole pieces embracing about two-thirds of the circumference of the armatures. In a certain sense this machine is the exact inverse of the original Gramme dynamo. In the latter we have a double set of horseshoe magnets, with consequent poles in the middle, embracing a single armature; in the Marcel Deprez machine we have two single magnets, with poles at the ends, embracing two armatures. We may thus consider either armature as forming the yoke to a field system which supplies the induction to the other armature. This system has been carried out even for multipolar machines. In the Machinery Hall there is exhibited a very large Marcel Deprez dynamo of the multipolar type in which there are also two armatures. The field consists of a series of cylindrical magnets, the axes of which are parallel to the spindle, and which are arranged in a circle so as to evenly surround both armatures with alternate poles. The adjoining pole pieces are connected by distance pieces of Delta metal, as it would obviously be inadmissible to bolt the magnets to a cast iron frame. Returning to the machine illustrated in Fig. 1, it will seem that the pole pieces are also connected at the top and bottom by frames of non-magnetic material, the lower frames serving at the same time to support the magnets on the bed plate. The armatures are independent of each other, and are independently driven, fast and loose pulleys being arranged so that even when obtaining power from the same countershaft one armature may be stopped whilst the other continues working. The advantages of the separate arrangement chosen by Marcel Deprez are not very obvious. In the first place the machine becomes rather long and heavy, and in the second place the employment of two armatures to do the same work which could be done with one rather larger armature entails a certain amount of complication which most users of dynamos would like to avoid. It might of course be claimed for this ma-

chine that the facility of obtaining double the current or double the pressure according to the coupling up of the armatures is an advantage because extending the range of practicability of the machine, and that on this account it would be particularly suitable for the three-wire system, but, on the other hand, the same advantages can be obtained by two separate dynamos, and probably with less expense. The following table gives the leading particulars of the high tension dynamos. Each armature is capable of producing a 50 ampere current at 600 volts terminal pressure, and the coupling up is in parallel:

MARCEL DEPREZ ARC LIGHT DYNAMO.

Terminal pressure	600 volts.
Total output	60 kilo-watts.
Revolutions per minute	625
Weight	6 tons.
Length over all	14 feet.
Width	5 feet.
Height	3 feet, 4 in.

"It will be seen from this table that, notwithstanding the high speed of 625 revolutions per minute, the dead weight of the machine is as much as 1½ cwt. per horse-power output. The other three machines are for low pressure services, some being wound for 1'5 volts and 500 amperes, and others for 160 volts and a proportionately smaller current. The latter are used for charging a set of Gadot accumulators. The distribution of current is effected by a switchboard, as shown in Fig. 2. The central portion of the switchboard serves for the arc light circuits fed from the 600 volt machine. By means of the central switches, *J* and *H*, the two armatures can be put in series or parallel, or can be independently connected each with half the number of lighting circuits. In all there are ten arc circuits, having an average length of 4,500 feet each, and feeding 12 arcs in series. Each of the 10 circuits going away from the switchboard is provided with a switch and fusible plugs in the outgoing and returning leads. The left hand side of the switchboard is required for the two machines which serve to charge the battery, the switches, *D E L K*, connecting the four armatures with the cells, whilst at the same time serving to cut out or put in end cells, so as to maintain the pressure on the lighting circuit constant. The number of cells in each battery can be varied either independently or simultaneously by means of counter-shaft and bevel gear, as shown in our illustration. The right hand side of the switchboard, containing the switches *A*, *B* and *C*, serves for the low pressure arc light circuit. Provision is made by means of the small multiple contact switches shown at the lower part of the board, for adjusting the strength of the field of the dynamos in order to vary the pressure within certain limits. The area lighted from this central station lies between the Machinery Hall and the luminous fountains. In the main transept there are fixed 50 Cance lamps of eight amperes, and under the central dome there are 16 lamps of the same power and three of 25 amperes. Current is further supplied to eight Cance lamps in the Swiss pavilion, 48 Pilsen lamps of eight amperes in some restaurants, 24 Pilsen lamps in the pavilion of the town of Paris, and 48 in the Gallery Dessaix, whilst several smaller groups of arc lamps are scattered in other parts of the Exhibition. In all the station supplies 216 arc lamps and 1,200 four candle-power glow lamps illuminating the base of the Statue of Liberty, and 1,400 ten candle-power glow lamps fixed in various other parts of the Exhibition."

Where the Alternating System is Used Without Danger.

(From the *Pittsburgh Dispatch*.)

The occurrence in New York City of so many deaths caused by contact with electric light wires is not without food for reflection in this city. So far Pittsburgh has enjoyed an immunity from such horrible affairs. During the eight years that the Allegheny County Light Company have been operating, not a single death has occurred directly attributable to contact with electric wires. This is due primarily to the care exercised in properly insulating the wires, and, secondly, to the careful method of placing the wires in position and in making connections.

Contributions to the Chemistry of Storage Batteries. No. 2.

BY E. FRANKLAND, D. C. L., F. R. S., READ BEFORE THE ROYAL SOCIETY, JUNE 20, 1889.

Under this title I communicated to the Royal Society, in February, 1883 (proceedings of the Royal Society, vol. xxxv, p. 67), the results of some experiments on the reactions occurring during the charging and discharging of a storage cell. I showed that no appreciable part of the storage effect was due to occluded gases, as had been previously suggested by some chemists and physicists; but that the act of charging consisted essentially in the decomposition of lead sulphate, whilst the discharge was produced by the recomposition of this salt.

The establishment of these, as practically the only reactions going on in a storage cell, enabled me to prescribe a very simple method by which the charge in any cell could be ascertained, for as sulphuric acid is liberated during the charging and absorbed by the active material of the plates during discharge, the amount of charge could at any time be measured by ascertaining the amount of free sulphuric acid in the cell; in other words, by simply determining the specific gravity of the electrolyte; and this method has since been very generally adopted by the users of storage batteries.

In continuing these experiments it soon became evident that the lead sulphate formed and decomposed in the cell could not be the ordinary white sulphate hitherto known to chemists, because, in the first place, the active material of the plates always remains colored even after discharge, and secondly, because whenever white sulphate is produced through abnormal reactions in the cell, it is afterwards decomposed only with extreme difficulty by the electric current.

In order to obtain some light upon the composition of the sulphate formed and decomposed in the cell, I have studied the action of dilute sulphuric acid upon litharge and minium.

ACTION OF DILUTE SULPHURIC ACID ON LITHARGE.

Finely powdered litharge was treated with successive portions of dilute sulphuric acid until the liquid remained strongly acid after prolonged trituration. The resulting insoluble buff-colored powder was washed with water till free from acid, and dried first at 100° C. and afterwards at 150–160°. The loss at this higher temperature was less than 0.2 per cent., and was therefore due to hygroscopic moisture.

PbO and SO_3 were then determined in the dried compound as follows: The salt was dissolved in a small quantity of pure concentrated solution of caustic potash, and the solution, after dilution, was saturated with CO_2. (According to H. Rose, COPbo″ is soluble in $COKo_2$, but not in COHoKo.) Any excess of CO_2, which might have caused the COPbo″ to dissolve, was avoided by warming the liquid with the precipitate on the water bath to a temperature at which the COHoKo begins to dissociate. The liquid was then allowed to cool and stand 12 hours before filtering. The COPbo″ was filtered off, converted into nitrate, and precipitated and weighed as sulphate. The sulphuric acid was determined in the filtrate from the COPbo″.

1.2964 grms. of the salt gave 0.6647 grm. baric sulphate and 1.4437 grms. plumbic sulphate.

These numbers agree closely with the formula:

$$(SO_3)_3\ (PbO)_5$$

as is seen from the following comparison of calculated and experimental numbers:

	CALCULATED.		FOUND.
$3SO_3$	240	17.71	17.61
$5PbO$	1,115	82.29	81.96
	1,355	100.00	99.57

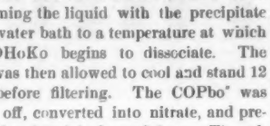
These analytical results suggest the following graphic formula:

The formation of this salt may be represented by the following equation:

$$5PbO + 3SO_4H_2 = S_3Pb_5O_{14} + 3OH_2$$

Litharge	Sulphuric Acid.	Buff lead salt.	Water.

The composition of this salt may be represented graphically, thus:



The formation of this salt is expressed by the following equation:

$$Pb_3O_4 + 2SO_4H_2 = S_2Pb_3O_{10} + 2OH_2.$$

Minium.	Sulphuric acid.	Red lead salt.	Water.

These, then, are the salts which constitute the original active material of storage cells when that material is formed by the admixture of sulphuric acid with litharge or minium respectively, and it is highly probable that one or the other of these salts takes part in the electrolytic processes of the storage battery.

It is fortunate that these hitherto unknown salts (and not the ordinary known sulphate) are formed in the cell re-actions; for, in the alternative case, lead storage batteries would be practically valueless.

If the buff lead salt be the active material of the battery plates, then the following equations express the electrolytic reactions taking place in the cell:

1. In charging—

(a). Positive Plates.

$$S_3Pb_5O_{14} + 3OH_2 + O_5 = 5PbO_2 \qquad 3SO_4H_2$$

Buff lead salt	Water	Lead Peroxide*	Sulphuric Acid

(b). Negative Plates.

$$S_3Pb_5O_{14} + 5H_2 = 5Pb + 3SO_4H_2 + 2OH_2$$

2. In discharging—

(a). Positive Plates.

$$5PbO_2 + 2SO_4H_2 + 5H_2 = S_3Pb_5O_{14} + 3OH_2$$

(b). Negative Plates.

$$5Pb + 3SO_4H_2 + O_5 = S_3Pb_5O_{14} + 3OH_2$$

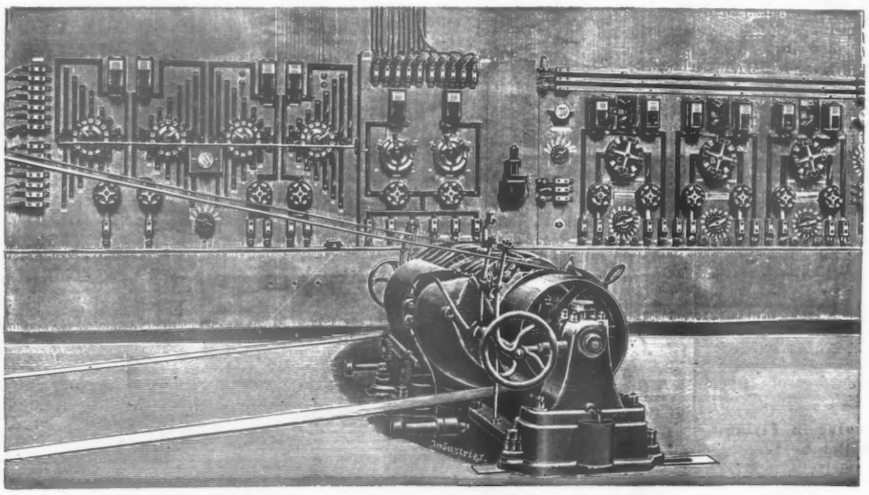


FIG. 2.—VIEW OF SWITCHBOARD OF THE DEPREZ SYSTEM.

ACTION OF DILUTE SULPHURIC ACID ON MINIUM.

Minium was treated with dilute sulphuric acid in exactly the same way as litharge, and the resulting brownish red compound dried first at 100° C. and afterwards at 150–160°. The loss at this higher temperature was again less than 0.2 per cent.

PbO, SO_3, and excess of oxygen were then determined in this salt in the following manner: The salt was first treated with concentrated hydrochloric acid in order to reduce all the lead to the non-oxide stage. The resulting mixture was then dissolved in caustic potash and treated as already described. The excess of oxygen was determined by finding the loss of weight which resulted from the evolution of CO_2, when the salt was treated with oxalic acid and dilute nitric acid.

2.1136 grms. of the salt gave 1.1978 grms. baric sulphate and 2.2710 grms. lead sulphate.

1.5110 grms. treated with oxalic acid and dilute nitric acid evolved 0.0910 grm. CO_2.

These numbers correspond to the following percentages:

SO_3	19.45
PbO	79.03
O	1.09
	99.57

which agree with the formula

$$S_2Pb_3O_{10},$$

as is seen from the following comparison:

	CALCULATED.		FOUND.
S_2	64	7.57	7.78
Pb_3	621	73.49	73.36
O_{10}	160	18.94	18.43
	845	100.00	99.57

If the red lead salt be the active material, then the following equations express the same electrolytic reactions:

1. In charging—

(a). Positive Plates.

$$S_2Pb_3O_{10} + O_3 + 2OH_2 = 3PbO_2 + 2SO_4H_2$$

Red lead Salt		Lead Peroxide	Sulphuric acid

(b). Negative Plates.

$$S_2Pb_3O_{10} + 4H_2O = 3Pb + 2SO_4H_2 + 2OH_2$$

2. In discharging—

(a). Positive Plates.

$$3PbO_2 + 2SO_4H_2 + 2H_2 = S_2Pb_3O_{10} + 4OH_2$$

(b). Negative Plates.

$$3Pb + 2SO_4H_2 + 2O_2 = S_2Pb_3O_{10} + 2OH_2$$

An inspection of these equations discloses, in the case of the red salt, a fact which has already been roughly observed in practice, viz: that only half as much active material is electrolytically decomposed on the negative as on the positive plates; whence it follows that the weight of active material on the negative plates need not exceed one-half of that upon the positive plates, for in the decomposition of the electrolyte, equivalent quantities of oxygen and hydrogen are evolved; that is to say, two atoms of hydrogen for each atom oxygen. But in the decomposition of the red lead salt, four times as many atoms of hydrogen are required to reduce the salt to metallic lead as atoms of oxygen which are necessary to transform lead of the salt into peroxide. When, however, the active material of the positive plate has once been converted into peroxide of lead, it seems probable that the red salt only is formed; at all events, until the discharge at high potential is nearly completed, when there are indications of the production of the buff colored salt. But this is a point requiring further investigation.

* Mr. Fitzgerald considers that this peroxide is hydrated.

The Eiffel Tower Struck by Lightning.

BY MONS. MASCART.

We have in a previous number mentioned the fact that the Eiffel Tower was struck by lightning on the 19th August last, and we now give the report on the subject addressed to the Académie des Sciences by Mons. Mascart:

"Several of our colleagues have thought that it would be useful to give some information on a stroke of lightning which struck the lightning-conductor of the Eiffel Tower during the evening of 19th August, and with regard to which some exaggerated reports have been published. I shall take the details from the report drawn up by Mons. Foussat, chief of the electric service, who happened to be on the highest platform during the thunderstrom.

"The tower is provided with a central rod at the summit and with eight oblique rods on the balustrade of the third platform. The bronze point with platinum end which terminated the central rod had been taken away a few weeks previous because it had been subject to oscillations which threatened to bring it down.

"At 9.40 P. M. a discharge took place on the principal lightning-conductor at the summit; it was accompanied by a fearful noise, similar to the detonation of two pieces of artillery of small calibre. Some red globules were detached from the point, they were probably due to combustion in the air of particles of volatilized iron. In fact, it was remarked that the screw-nut which terminated the rod showed some blisters which had to be filed off to provide the center rod with new terminals in form of an aigret.

"On the lightning-conductors of the platform luminous flashes were observed at different times and accompanied by a loud crackling noise.

"The guard of the lighthouse was near his apparatus, two men were operating the projectors on the platform, and Mons. Foussat was himself leaning against the railing, looking at the lightning-rod of the lighthouse. It is interesting to note that none of these four persons felt the slightest shock at the moment of the stroke; however, on account of the violent rain and the possibility of danger in case of another discharge, the projectors were extinguished, and the three persons stationed on the platform withdrew to the laboratories. A cloud which had descended to the level of the lighthouse was brightly illuminated. This undoubtedly created the impression in a number of Parisians, living at a distance, that the summit of the tower after the lightning seemed surrounded with an electric light, so brilliant that it eclipsed the light of the projectors.

"I have to add that the meteorological instruments placed beneath the lightning-conductor have suffered no damage.

"This stroke of lightning, in short, conforms to all known facts; it has also shown that the connection of the tower with earth is perfect, and that there is absolute security against lightning in the structure."

Cost of the Paris Exposition.

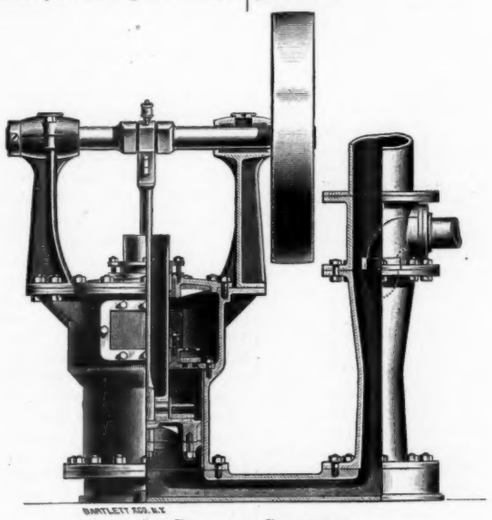
Many strangers have been speculating on the cost of the Paris Exposition. It amounts to $7,600,000; but when to this is added the various amounts expended by the French ministerial department from the funds placed at their disposal for the purpose of entertaining foreign guests and for other incidental outlays, and those by foreign governments and individual exhibitions, the total, according to a rough estimate of the department of public works, cannot fall far short of $30,000,000. The expense of the glittering exhibition on the Champs de Mars in money was large, and so was its cost in life and limb. It is calculated that during the construction 6,530 men were treated for injuries or for illness resulting from exposure; 300 workmen hurt their legs; 260 received severe injuries to their eyes from projecting timbers or bars of iron; 114 were scalded or severly burned, and 50 had their fingers cut off. The deaths from falls are put down at the modest figure of 24, but it is believed that they were far more numerous, and that the correct number was not given by the promoters of the exhibition.

Improved Belt Power Air Pump and Condenser.

The air pump and condenser, illustrated on this page, has been newly designed by the builders, Conover & Company, 219 Market street, Newark, N. J., in answer to the demands of power users who are seeking the greatest attainable economy in all details of the modern steam plant.

With the introduction of high speed compound engines, there is felt the need of a thoroughly efficient and simple condensing apparatus. The power required to drive it must be reduced to a minimum, and this same power must be of the most economical sort, otherwise the advantages gained by condensing will be seriously affected, if not wholly counteracted. In fact it is a matter of record where tests have proven that certain engines have shown better economy running non-condensing than when condensing, owing to the very wasteful manner in which the power was applied to the condensing apparatus.

In presenting this air pump and condenser to the public, the builders believe that they are offering a highly efficient, simple and durable arrangement. As will be seen by the engraving, the air pump is run by belt, which can be direct from the engine shaft or from a countershaft, whichever may be the more convenient. Being driven by the main engine, it is obvious that the power used to operate the air pump must of necessity be of the same economy as the engine. Thus, if the engine in question be compound condensing, running on two pounds of coal per horse-power, or less, it necessarily follows that the air pump will be operated by a similar economy. An examination of the engraving will make the operation of air pump and condenser quite plain. The spray distributes the injection water in such a manner that every particle of steam must come in contact with the water, and thus effect condensation with a minimum amount of water and at the same time heat the overflow to the maximum temperature. The opening from condenser to air pump is shaped to allow the greatest quantity of water to flow through a given opening. The pump is made amply large to remove the greatest quantity of water needed for condensing to the full capacity of condenser. The reciprocating parts are counter-balanced by means of a weight in the wheel to insure smooth running. As will be seen, the air pump is vertical and single acting, and this the builders believe to be the best form to avoid air locks. In fact, the design throughout looks to the avoidance of all corners or pockets where air can collect and remain. This condenser is specially suited to the requirements of high speed compound engines in electric light and power plants, because it can be run at a speed independent to that of the engine, or it may be attached to more than one engine. It is also adapted to be applied to existing plants as a saving of fuel, or an increase of power on same fuel. The machine is made throughout of the best of the several materials; all wearing parts and valve seats that come in contact with injection water, are made of the best composition, and the workmanship is of the best. When the air pump is in operation the valves and stuffing box are constantly covered with water, effectually sealing them. All parts are easily accessible without dismounting wheel or shaft.



AIR PUMP AND CONDENSER.

Cincinnati, O.—Articles of incorporation were filed last week by the Western Electric Company, of Cincinnati, with a capital stock of $10,000, the incorporators being Donald D. McDougall, John O. Gardell, G. Taylor, E. Woods, Wm. J. Schultz, Thomas J. Schamel and Court P. Benton.

Memphis, Tenn.—The Memphis Electric Railway Company applies for the right of way for 30 years over the streets and alleys of the Taxing District and through such private property as to which they may acquire the easement or fee for the establishment and operation of a system of electric motor railway cars and trains for passenger purposes. Thomas H. Allen, Jr., E. R. Thomas, M. B. Trezevant, J. M. Peters, Robert S. Vivian, corporators.

Newark, N. J.—The Summer Avenue Railroad Company recorded articles of incorporation in the County Clerk's office to day. The incorporators are Theodore Clarkson and Richard Coff, of New York; Milton C. Quimby, Henry A. Hudson, Henry Ehman, Arthur W. Hapley and John Dooley, of Newark. The capital is $100,000. The object is to construct a double track street railroad from the center of Bloomfield avenue via Summer and Vernon avenues to Lake Meet. The company pledges itself to keep proper rolling stock for the conveyance of passengers, to give transfer tickets to other railroads when lines meet theirs, and to use such motive power as the authorities of Newark may authorize.

West Troy, N. Y.—A certificate of incorporation of the West Troy Electric Light and Power Company was filed in the office of the Secretary of State. The capital is $75,000 and the trustees George H. Moreman, George W. Hunt, Hugo Tollner, William B. Lindsay and John Gallagher. Business office in Watervliet.

Amherst, Mass.—The Amherst Gas and Electric Lighting Company have reorganized with these officers: President, Henry F. Hills; clerk and treasurer, George Cutler; directors, H. F. Hills, D. W. Palmer, E. D. Bangs, Parnell Munson, F. E. Whitman, E D. Marsh, P. Alexander. The new electric light building is to be built.

Little Rock, Ark—M. W. Egan, Chief of the Little Rock Fire Department, together with Charles Kramer, the Department Secretary, and C. J. Wing, are organizing a company for the purpose of operating an electric fire-alarm system there. It is believed that the city will make a contract for the rental of the plant until such a time as it is able to purchase it.

Milwaukee, Wis.—The ordinance giving the Milwaukee Telegraph Company a franchise was reported on favorably by the Committee on Judiciary.

Indianapolis, Ind—Articles of incorporation have been filed by the Electric Light, Gas Heating and Coke Company, of Jeffersonville; capital stock, $100,000.

Belleville, Ill.—Electric Light and Coal Company; to supply coal and furnish electric light and power; capital stock, $70,000; incorporators, John Brosius, G. W. Knobeloch and John E. Thomas.

Chicago, Ill.—Union Electric Light and Power Company; to furnish electric light, heat and power, and to manufacture electrical goods; capital stock, $150,000; incorporators, Alfred F. Adams, Alvin W. Walkey, Joseph F. Barton.

Springfield, Ill.—Alfred S. Brown, of New York, filed a certificate stating that he was general superintendent of the Mutual Union Telegraph Company when it was transferred to the Western Union Telegraph Company, February 10, 1883.

Milwaukee, Wis.—The directors of the Edison Electric Illuminating Company, of Milwaukee, organized by electing the following officers: President, Charles Ray; vice-president, H. C. Payne; treasurer, C. F. Ilsley; secretary, J. H. Tweedy, Jr.

Indianapolis, Ind.—The National Electric Headlight Company, capital stock $500,000, was incorporated. The company is for the purpose of carrying on the business of manufacturing and selling headlights for locomotives. The directors are R. F. Pence, H. H. Fulton, L. A. Boyd, and Geo. C. Pyle.

San Francisco, Cal.—The Pacific Auxiliary Fire Alarm Company has incorporated for general business in fire alarm apparatus and supplies. Directors, John I. Sabin, Percy T. Morgan, J. C. Cebrian, William G. Oliver and F. W. Eaton. Capital stock, $500,000, divided into 25,000 shares, of which 2,500 have been subscribed.

Frostburg, Md.—Frostburg Electric Light and Milling Company has been organized with the following officers: President, Thomas J. Price; secretary and treasurer, H. B. Colborn; manager, W. H. Evans; directors, D. D. Price and Horace Evans. It is expected that Frostburg will "have light" in about three weeks time.

Little Rock, Ark.—A preliminary meeting was held last week to form a company for the building of telephone lines from Little Rock to Fort Smith and intermediate points on the west, and to Arkansas City and intermediate points on the southeast. It is proposed to extend the line from Conway to Pinnacle Springs and Greenbrier, and also from Morrilton to Springfield.

Elgin, Ill.—The Elgin City Electric Railway Company, which secured the franchise, will lay nine miles of track within a year—but nothing will be done toward it this fall. Bruce Payne, alleged owner of the present road, which is three miles in length, has been bought out, it is said, for $10,000 in cash and $20,000 in stock of the new company. William Grate, of Elgin, is pushing the enterprise.

Little Rock, Ark—The Arkansas Territorial Telephone Company, capital, $50,000, was organized here. James K. Perry, of Dardanelle, is the president; George M. Martin, of Conway, vice president; C. J. Lincoln, president of the Bank of Little Rock, treasurer; D. R. Wing, secretary, and John W. Davis, general manager. The company will build at once from Little Rock to Fort Smith, also to Arkansas City and in all directions from the main line.

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We invite correspondence from Electricians, Inventors, and the Telegraph and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

Subscribers can at any time have the mailing address of their paper changed by sending both old and new address.

NEW YORK, NOV. 2, 1889.

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The electrical interests should awake to the fact that a World's Fair is to be held in this county in 1892.

The State Capitol at Denver, Col., now under construction, is to have its legislative halls fitted with electric vote-recording apparatus which, the law requires, shall be the system designed and patented by A. G. Safford, of Washington, D. C. Safford's plan is to have the complete yea and nay vote printed, in type, on a single sheet of paper, which can be filed in the legislative journal. The printing apparatus is actuated by push-buttons on the members desks,

THE INJUNCTIONS SUSTAINED.

JUDGE ANDREWS' DECISION IN THE ELECTRIC LIGHT CASES.

Judge Andrews handed down, Tuesday of this week, his decision in the case of the Electric Light Companies' injunctions, in which he sustains the injunctions, with slight modifications, until the cases can be tried.

This is looked upon as quite a victory for electric lighting interests.

The question of how to spell the name of that popular metal has finally been decided by the company that will have the most to do with it in this country, and hereafter on all the printed matter of the Aluminum Brass and Bronze Co. there will be but one "I" in aluminum. We agree with the Aluminum Company, for life is short and ink and lower-case vowels cost money.

The city of St. Louis may well be watched even in this era of electrical development. By January 1, 1890, every street of the city will be illuminated, it it said, by arc and incandescent lights; households will be connected with the public service wires, as gas mains are now tapped; electrical stoves it is averred have already been introduced and will soon be commoner than gas stoves. Two street car lines are now operated by electricity and four more will bewithin a year.

Our esteemed contemporary, *Progressive Age*, issued a very interesting number October 15, containing a full report of the annual meeting at Baltimore of the American Gas Light Association. A number of entertaining illustrations, relating to the meeting, add interest to this issue, which also is the first and only gas journal in the world to be printed by a gas engine. A very large edition of this issue is evidence that the gas interest appreciate the enterprise of one of its chief representative journals.

The enterprising West should be on its mettle to make a good showing at the next meeting of the National Electric Light Association at Kansas City in February, 1890. It has long been claimed by the present few Western members that should the Association meet once in the far West a decided increase in membership from among the central station men in that section could be counted on. We hope to see such a result. It can be brought about, no doubt, by the persistent work of the members of the Executive Committee, all of whom, with three exceptions, are Western men. The increase in membership at the Kansas City meeting will show whether this work was done or not.

One Frank S. Gardner, "Acting Secretary N. Y. Board of Trade and Transportation," has sent out to telephone subscribers circulars asking contributions of $1.00 a year to "The Telephone Subscribers' Association of the State of New York." It may be news to a few of the said subscribers to find they are members of this "Association." If they all contribute $1.00, the secretaries, acting secretaries and other hard-working officials of this mythical organization, may find the emoluments at least commensurate with the services required. There are about 7,000 subscribers in New York City and 3,000 in Brooklyn and vicinity, and $10,000 a year is a very snug little income.

Another decision in the storage battery suits is published in this issue. The Electrical Accumulator Company are again awarded a preliminary injunction, this time against the Julien Electric Company, whose batteries are in use on Fourth avenue street railway, this city. The latter company claim that the decision will only affect a few of their cars, and that the method of using a paste in the construction of their batteries has been discarded. This is the third injunction secured by the Accumulator Company and would indicate that there is considerable value to the claim in the Faure patent, which the court had previously decided belonged exclusively to them, *i. e.*, the application of the active material in the form of a "paste or cement,"

THE EXECUTIVE COMMITTEE MEETING AT THE ELECTRIC CLUB.

The meeting of the Executive Committee of the National Electric Light Association, held at the Electric Club, New York, on Friday and Saturday, Oct. 25th and 26th, was a gathering of more than usual interest to the whole electric light fraternity. The object of the meeting, as stated in the notice sent out by Secretary Garratt, was to take action on the imminent danger to high tension current interests developed in New York, but affecting the whole country. There is no doubt that the several deaths in New York from contact with electrical conductors, are producing a prejudicial opinion in the minds of a portion of the general public against electric lighting as a whole. It therefore seems to us that the meeting was very timely. A resolution was adopted, which may be found in another column, and which seems to be a carefully worded and thoughtful instrument. It sets forth the whole question in a way that will certainly be satisfactory to every electric light man who is not exclusively interested in bringing about restrictive legislation.

The Executive Committee deserves commendation for its action. The situation was beginning to look as though electric lighting, outside of the electrical press, was without advocates, when if the consumers were consulted it would be found that they one and all want this new and beautiful illuminant, and are not carried away by the clamor of an unthinking public and a very much prejudiced daily press. As we have said before, let the New York companies perfect their aerial construction and accidents and clamor will soon cease.

INCANDESCENT LAMPS ON BUOYS.

A recent report made by Capt. Millis, of the Lighthouse Board, in relation to the electric lighted buoys at the Gedney's channel entrance to New York harbor, states that a year's service shows that the system is a practical success. During the last nine months over 220 ocean vessels passed through the channel between sunset and sunrise. The buoys withstood the heavy storms of last September without drifting from their positions, and not more than two lamps out of six were extinguished at any one time. On one occasion a buoy was run down by a vessel and entirely submerged without injury. Some trouble has been experienced from moisture getting through the lamp sockets and destroying the connections, but a new form of lamp has been devised which promises to be free from this objection.

It has been found that the life of lamps made with red glass globes was much shorter than that of the uncolored ones, an effect which was attributed to the interception of a greater portion of the heat radiated from the carbon filament, and lamps with bulbs of clear glass are now used on all the buoys, lanterns lined with red glass being used to produce the red lights. Capt. Millis notes the fact that a building on shore, very near the buoys, was twice struck by lightning while the buoys and their connecting cables were uninjured, and adds, "It is probable that the use of an earth return insures greater safety from damage by lightning than it would obtain if the circuits were entirely insulated."

The present autumn marks the establishment of new courses in electrical engineering at many of our colleges and institutions of learning, following the lead and example of those in whose curriculum electricity has long occupied an important position. In some instances, in the smaller country colleges, it is acknowledged that this action has been taken in order to increase the attendance, and consequently the revenues, by the drawing power of the word electricity. The benefit accruing to the student and also to the electrical industry, where such a course has been pursued without special regard to the requisites of a thorough electrical training, is of questionable value. A knowledge of electricity cannot become too general, but the danger lies in the possibility of an over confidence and over estimate of ability and value, in consequence of which there sometimes comes a drop, the recovery from which is slow and toilsome.

ELECTRICAL NEWS.

What is Transpiring in Electrical Circles in the Leading Cities.

OUR CHICAGO LETTER.

Return Call-Box.—Mr. C. G. Armstrong, manager of the electrical department New Haven Clock Company, has invented and patented a new return call district messenger box, which will be placed on the market at an early date. The boxes are made with from one to 10 calls, each indicator consisting of a push button on which the nature of the call is printed; the return call throws the button back in its former position.

Incandescent Lamps.—The Phœnix Lamp Company report business rushing, and will soon increase their force of help. The company had some trouble last month on account of receiving a poor lot of glass which they were not aware of until the goods were on the market. "Experience being a good teacher," their customers are assured that it will not occur again.

Personal.—Mr. W. L. Candee, treasurer of the Okonite Company, paid the REVIEW office a visit on the 21st inst.—G. C. Bailey, of Roebling & Sons Company, met with a very painful accident at St. Paul last week, while paying a visit to the Cable Company's power house. By a mistep he fell in the pit under the tension carriage, and in his efforts to save himself grasped a steam pipe, badly burning his hand and arm.

The Electric Club.—Invitations are out for a farewell dinner to be given by Mr. S. A. Barton at the Chicago Electric Club, on Monday evening, October 28, at 9 o'clock. A special meeting of the Club has been called by Secretary Kreidler for Monday evening, the 28th, asking all members to be present, as it is the last meeting at which President Barton will preside.

Electric Railways.—The Sprague Electric Company closed a contract to furnish the Sioux City Railway Company 15 motor cars. Twelve miles of road will be put in operation at once.

Electric Motors.—The "C. & C." Electric Company have received three motors which will be placed in the new Auditorium building, one seven and two five horse-power.

Sales.—The Excelsior Company have closed contract to install a 150 light incandescent machine in the Strong City Bank building, Strong City, Kans. As a result of the above company's exhibit at the St. Louis Exposition, they have closed contracts to furnish motors 70 horse-power in the aggregate, also two 30 light arc machines.

Denver, Col.—The Carpenter Electric and Storage Company, with a capital stock of $2,500,000, has been incorporated in Denver, Col. The directors are H. H. Carpenter, of New York; Edward Eddy, Wm. H. James, Dennis Sullivan, James B. Grant, Wm. A. Johnston and Lewis A. Kent, of Denver. The object of the company is to exploit Carpenter's newly-patented storage battery, the main feature of which consists in the use of plates made of Cerussite, or native carbonate of lead, which is moulded into blocks, perforated with small holes and enclosed in an envelope of thin sheet lead. The Denver parties named own mines which produce quantities of Cerussite, for which there has heretofore been no demand, and one object in organizing an electric company is to utilize it.

Sales.—The Thomson-Houston Co. report the following sales for the week ending Oct. 25th: "Charles" Block, Denver, Colo., 800 incandescent lights; Ottumwa Street Railway & Electric Co., 75 arc and 1,300 alternating lights, to be used in connection with the street railway recently closed with the above company. Gleason & Bailey Mfg. Co. report business on the increase.

Personal.—S. Leach, General Manager of the River & Rail Electric Company of Denver, Colo., was in the city Saturday.

Chicago, Oct. 25, 1889. D. B. D.

A LETTER FROM MINNEAPOLIS.

Leonard & Izard.—Mr. Huey, agent for Leonard & Izard in the Northwest, reports a great increase in business in the past six months. The above company are wiring business houses for central station lighting at the rate of four to five hundred lights per week in this city alone. They have also contracts for the installation of the following isolated plants, Edison system: Masonic Temple, 1,700 lights. This will be a novel plant in its way, there being many hidden lights, spirals, lamp banks, etc., all to be controlled by switches; in fact, in the Masonic Hall proper, it will be a mystery throughout. Minneapolis Public Library, 1,200 lights; Germania Life Insurance Building, St. Paul, 1,400 lights; Northwestern Guarantee Company, 3,000 lights; two Ball engines of 100 horse-power capacity each will be used in furnishing power for this plant; Fergus Falls, Minn., Insane Asylum. The number of lights in this building cannot be stated, as many extensions to the building are contemplated. The number will probably reach up into the thousands. As this will be largest insane asylum in this

country, all lights in cells, corridors and wards will be set deep in the ceilings and protected by wire screens from the inmates. Grand Canon Hotel, Yellowstone Park, 600 lights, and nine other large hotels lately built in the park. They are wiring the Corn Exchange for 500 lights. This will be lighted from the central stations. The company have placed a number of stationary motors lately for running presses, elevators, etc. Prominent among the motor sales is one of 15 horse-power that will be used in furnishing power for compressed air baths.

The Marr Construction Company also report business rushing and have the following contracts closed: Winona Lumber Company's saw mills, 400 lights of the Westinghouse direct incandescent; Winona hotel, 750 lights, Westinghouse; they have also a contract to wire the Sykes building for 400 lights, system undecided. The above company are the agents for the Standard Underground Cable Company, of Pittsburgh, Pa., and have just closed a contract to furnish to the city 53,000 feet of this cable for the use of the fire department. From the fact of this company having put in upwards of 7,000 lights in the past eight months, it will be seen that Minneapolis takes more interest in electric lighting.

The Minneapolis Electric Construction Company have a new battery invented and patented by Mr. W. C. Thompson, of the above company. The battery will be called the "Crescent." The following points are claimed by the inventor: Large carbon surface, the carbon pole piece extending through the glass cover, a perfect contact metal clamp surrounding the pole piece. This clamp sits on a rubber gasket, as does also the zinc holder and the glass cup, so that when closed becomes air tight and prevents the creeping of salts.

Local Electric Lighting.—The rapid growth of the Minneapolis Brush Electric Light Company, and its recent installations of machinery, is a matter worthy of note. The company have a boiler capacity of 2,000 horse-power, and at this writing are supplying current to 875 arc and 1,200 incandescent lights. The latter are run from the arc circuit in multiple series. Four engines are used at the power station, prominent among which is one recently installed. This latter is a Reynolds-Corliss triple expansion of 1,000 horse-power and will drive a Munson belt 68 inches wide, the largest belt in the world used in driving electric light machinery. The company have in use 10 boilers using oil very successfully as fuel. An automatic oiling device is used, the oil being pumped from one point to the shafting and 20 dynamos now in use, it is then returned by means of pipes to the basement where it is filtered. The company have 400 miles of wire on poles and are furnishing current to 35 motors, an aggregate of 100 horse-power. They are also furnishing power to three 1,500 light Westinghouse dynamos which are loaded to their full capacity. B. A.

Minneapolis, Oct. 22, 1889.

OUR WASHINGTON LETTER.

A Good Showing.—The directors of the Eckington and Soldier's Home Railway Company (electric), were recently elected for the ensuing year. It is my pleasure to announce that the capital city's first electric road has been a success from the start, as is evinced from the following figures: Total number of passengers carried was 503,860; average daily number, 1,505. Eckington, the place to which the electric road runs, is a little suburban town owned by a number of prominent capitalists. The road was established by them for the transportation of the residents. Property in Eckington has greatly advanced in value in consequence. A Westinghouse plant is being erected and will supply the town with light. It is a model town as regards electric light and power.

R. R. Tracks.—If the Boston people are so well satisfied with their electric railroad tracks, with grass between the rails, they would be "pleased to death" with ours. Our tracks are laid on asphalt streets with a new form of grooved rail laid "flush" with the surface. The ballasting is all below the asphalt, which is also laid between the tracks so that a person can drive over them after dark in any conveyance and never know that they are there.

The World's Fair.—When Congress meets we, of Washington, will unlimber and begin our battle for the World's Fair. There is little doubt here of our success. We understand the noble art of lobbying better than our competitors, and will do our best to convince the Legislators of the truth of the words of a great French writer, "*Les absents ont toujours tort.*"

Electrical Execution.—I lately heard quite a novel method for electrical execution proposed, and since you New York men will perhaps be interested I give it for what it is worth. The proposition was to stand the victim on an insulated stool and charge him up to a high potential from a source of electricity. Upon stepping to the ground a discharge would take place and produce the desired result. G. E. M.

Washington, D. C., Oct. 26.

OUR BOSTON LETTER.

An Excellent Choice.—The many friends of Mr. Edward Blake, treasurer of the New England Electric Company, which controls the business of the Sprague Company in New England, are congratulating him upon his election at Minneapolis as president of the Sprague Electric Association. It is the opinion of his New England friends, who perhaps know him best, that a better choice could not have been made.

Results of the Electric Light Insurance Conferences.—As a result of the recent conferences between the electric lighting interests and the Boston board of fire underwriters, arrangements are now in progress, and will be completed, limiting the inspection expenses in Boston to $4,000 a year. One-third of this will be assumed by the Edison Illuminating Company and one-third by the Boston Electric Light Company; the remaining third will be assumed by the board, but collections will be made of interested outside parties as far as possible. The insurance interests have been represented during the conferences by Mr. Osburn Howes, Jr., secretary of the board of fire underwriters.

Long Distance Power Transmission.—On Wednesday next, October 30, at the annual meeting of the New England Cotton Manufacturers Association, to be held at the Rogers building of the Institute of Technology, a paper of much electrical interest will be read. While the meeting will be devoted largely to a consideration of matters pertaining to cotton manufacture, engineering and other matters tributary thereto will as formerly be made a feature of the gatherings. At the coming meeting Mr. W. S. Kelley, of Lowell, Mass., will present a paper on the "Cost of Long Distance Electric Power Transmission." At the last meeting Mr. Kelley presented a paper on the general question of the use of electric motors in mills, and the present paper will be supplementary in its nature and treating of topics pertaining to the elements of cost, in answer to practical questions asked by manufacturers present at the previous meeting when the first paper was read.

An Electric Engine Exhibition.—In the *Herald* building is shown an electric engine which is going to put an entire and sudden stop to the electric motor business, that is if the statements of the gentleman in charge are unbiased by personal prejudices. It is made of eight magnets, four at each side of the center of an oscillating beam. The alternate attractions and repulsions of the two armatures convey a motion to the beam which is conveyed to the shaft by a friction clutch arrangement. Such is the fine adjustment, according to the exhibitor, that no pounding accompanies the oscillation, $\frac{1}{16}$ of an inch air cushion intervening on each stroke. An important feature is the universality of the motor, so to speak, as the inventor states it is immaterial what kind of a current is used, alternating, incandescent or arc currents being equally good, and storage batteries or primary jars being just meat for it. Through some inadvertance, no kind of current is supplied in the exhibition room, but the working of the machine is shown by hand power and it will work just as well by electricity, again on the authority of the disinterested exhibitors. The switch for the proper distribution of the current is not shown, and for reversing the motion a change of the friction clutches would probably be necessary, which change in street railway practice would necessitate a delay of perhaps 15 minutes. However, the rapidity and economy of the system would doubtless render any little delays of this sort unimportant. The stock of the company is now selling for eight dollars a share, on a par value of ten dollars. The exhibitor assured me that it would not sell at those figures long, and after a careful study of the facts I am inclined to agree with him.

Electric Lights Now Illuminate the coal wharf of E. S. Hamblin & Company, and vessels unload and discharge as well by night as by day. Frank Ridlon & Company furnished the dynamo and 20 arc lamps of the Fuller-Wood type, 2,000 candle-power each. The engine and boiler are of the portable type and self-contained. The work of installation was done by the Wright Electrical Engineering Company. The Wright Company is now wiring the public library, townhall and many private residences and stores in the town of Winchester, Mass., for incandescent illumination.

Notes.—The town of Canton has refused to reconsider the contract awarding the lighting to the Westinghouse Company.—The New England office of the Westinghouse Company has installed isolated plants recently at St. Paul's school, Concord, N. H., and for the Boston Heating Company.—The firm of F. E. Pettingell & Company received one order last week for 50,000 pounds of P. and B. line and American weather proof wire.—Mr. F. G. Cartwright, of the firm of J. F. Barry & Company, who have just put in the Watervliet electric railway at Troy, N. Y., was a visitor at this office last week.—The Electric Piano Company will open warerooms at 180 Tremont street in a few days. T. W. S

Boston, Mass., Oct. 28, 1889.

The Electric Light Association on the Situation.

RESOLUTIONS ADOPTED BY THE EXECUTIVE COMMITTEE OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION RELATING TO THE ELECTRIC LIGHT QUESTION IN NEW YORK.

A meeting of the Executive Committee of the National Electric Light Association was held at the Electric Club, Friday and Saturday of last week. Among the out-of-town members present were E. R. Weeks, of Kansas City, A. J. De Camp, of Philadelphia and J. F. Morrison, of Baltimore. A discussion of the situation in New York City and its possible effect on the electric lighting of the country was generally participated in, and resulted finally in the adoption of the resolutions published below. These resolutions were sent out by the Associated Press and were quite generally published in the press of New York on Sunday last, and are as follows:

Whereas, There has been considerable discussion of late regarding the possibility of successfully operating underground wires and successfully insulating overhead wires carrying currents, both direct and alternating, of the intensity now in use for arc and incandescent lighting; and

Whereas, It is proper that an expression of opinion on this vital subject should be heard from the National Electric Light Association, the object of whose members is to supply currents of all electro-motive forces for lighting, heating, welding, telegraphing, and for all the uses to which this protean power can be applied and whose membership, extending over every State and territory of the United States, is made up of those actively engaged in distributing this power of manufacturing the machines and supplies by which it is produced, distributed and utilized; therefore, be it

Resolved, That the following is the sense of the executive committee of said association, now met for the purpose of making itself heard by the public and others in authority.

1st. That currents, both direct and alternating, of the intensity or electro-motive force now in use in this and other cities of the country, are absolutely necessary for the successful and economical distribution of electricity for arc and incandescent lighting and power purposes, and that to substantially reduce the electric pressure or electro-motive force of the current now in use would so increase the cost of electric light and power as to put them out of the reach of many of their present consumers and greatly cripple the electric light and power industries, in which many hundreds of millions of dollars have been invested and which has become a public necessity.

2d. That the accidents which have recently occurred in this city from contact with the overhead wires have been due to faulty construction and defective insulation, coupled with restrictive legislation and divided responsibility, which for years have prevented such comprehensive repairs and reconstruction as would have insured safety and good service. And, further, that the progress in the art of insulation has been such that overhead wires carrying direct and alternating currents of the intensity now in use can be so insulated as to be safe. The correctness of our position is shown by the fact that alternating currents of five times the intensity of those used in this city for electric lighting are operated without accident to person or property.

3d. We deprecate the effort on the part of certain electric lighting interests that have committed themselves to the use of low tension currents to so direct the present public discussion as to bring the high tension, alternating and direct currents, into disfavor, in the hope of benefiting themselves and injuring their rivals. We regard the present discussion as beneficial to the public and the electric lighting industries in that it will result in bringing more forcibly to the attention of the public authorities and the electric illuminating companies themselves the necessity of adopting proper rules and regulations insuring the use of wires of good insulation, scientific construction and distribution and of a thorough and systematic plan of inspection and repair of overhead wires, and generally the adoption of such precautions (we are confident) can and will insure safety to the public as well as to the employés of the companies themselves.

* * The Utica, N. Y., Belt Line Street Railway Company has ordered an increase of stock and bond issue for the purpose of raising funds necessary to equip the road with electric power. Mr. W. M. Clark, of New York, has conducted the negotiations for placing the bonds, and to him is largely due the action of the company in making the change to electricity—a change the company and its stockholders will never regret.

PERSONAL.

Mr. A. R. Foote, in charge of the electrical department of the Census Bureau, is in the city with headquarters at the Electric Club.

Mr. M. J. Francisco, of Rutland, Vt., was a New York visitor last week, attending a meeting of the Electric Club of the committee on legislation of the National Electric Light Association.

The many friends of Mr. Geo. T. Manson in electrical circles were probably not aware that he had political proclivities, and that the prohibition ticket in Brooklyn claimed him as one of its representatives.

Mr. H. C. Sprague, superintendent of telegraph for Kansas City, Fort Scott and Gulf Railway systems, was a Kansas City visitor in the metropolis last week. Mr. Sprague had been attending the meeting of the Railway Telegraph Superintendents at Washington.

Prof. E. G. Acheson, of Pittsburgh, the inventor of the system of producing electricity by means of heat—or rather increasing the electric product by the application of heat—was a New York visitor last week. Further announcement of what Mr. Acheson has accomplished will be awaited with interest.

Mr. John A. Barrett, the well known electrical inventor and expert, who has been for a long time connected with the long distance work of the American Telephone and Telegraph Company, resigned last month and will in future devote himself to his own inventions. Mr. Barrett is one of our best informed electrical workers in the two branches of electrical work, the manufacture of cables and of primary batteries.

Mr. J. J. Carty, of the Western Electric Company, has resigned to accept the position of electrician of the Metropolitan Telephone and Telegraph Company. As New York is the greatest city in the Union, it is but proper that the best electrical talent should be found here, and in securing Mr. Carty the great Metropolitan Company has added to its staff a young man of much promise whose work has ever been progressive and intelligent.

Sumner I. Kimball, superintendent of the Life Saving Service, is the American member of a committee appointed by the International Maritime Conference now in session in Washington, D. C., to investigate and report upon any plans and devices submitted for examination. It is understood that various electrical schemes which, their promoters claim, will lessen the dangers of ocean navigation will be brought forward.

Mr. O. W. Graves, who has for a great many years been one of the attaches of the Ansonia Brass and Copper Company, has assumed the duties of the position held by Mr. T. L. Fowler, whose acceptance of the general managership of the Aluminum Brass and Bronze Company is mentioned elsewhere. The electrical fraternity will find Mr. Graves an efficient and obliging official, and the wire consumer who will trust his order with him will undoubtedly be satisfied.

Underground Telephone Work in Washington.

The Chesapeake & Potomac Telephone Company is about commencing a job of underground construction of a heavier character than any it has hitherto attempted. A line of subways will be laid from the Washington, D. C., Exchange, northward, a distance of 2,100 feet, which will contain 20 separate compartments, $3\frac{1}{2}$x8 inches, each capable of carrying three cables $1\frac{1}{2}$ inches in diameter. This subway will be made up of square terra cotta pipe in three-foot sections, each section containing two rectangular compartments of the sizes given. These sections are joined together by wrapping the joints with coarse hemp sacking saturated with asphalt. A large trench will be dug and the terra cotta pipe laid in it, four rows wide and three tiers high, the different layers being separated by a thin layer of earth. On top of the whole will be placed a covering of two-inch plank to protect the conduits from mechanical injury. The top of the subway will be three feet below the surface of the street along the greater part of the line, but will be deflected to pass over and under several large water mains. Manholes will be built at every street crossing. The cost of this work will be about $12,000, and it is intended as the commencement of a system which will eventually cover the city, and provide metallic circuits for the entire exchange service.

Telephonic News.

*** An electric spark has been photographed by means of a special camera, in which the sensitive plate rotated at, it is said, a velocity of 2,500 revolutions per minute.

*** The Telephone Exchange at Denver, Colo., was considerably damaged by fire last week, and service was discontinued for four or five days. The loss amounted to about $5,000.

*** Erie Telephone net earning for July and August are reported as $41,600, against $33,400 in 1888, an increase of $8,200. These figures indicate net for quarter ending September 30th of over $62,000.

*** The telephone company at Clarinda, Iowa, have abandoned their exchange, the number of subscribers not justifying the expense of maintaining the lines. A. F. Cutter, the general manager of the company, offered to maintain the exchange if he could procure 40 subscribers, but his proposition failed.

*** There is a scheme on foot to run a telephone line from Little Rock, Ark., to Pine Bluff, then through to Fort Smith, taking in all the principal towns along the Fort Smith road as far as Russellville, then over to Dardanelle. At Conway it is proposed to extend the line to Pinnacle Springs and Greenbrier, and from Morrilton to Springfield.

*** A French electrical journal estimates that the total length of the telegraph wires (including submarine cables) of the world in use at the present time exceeds half a million miles. Four-fifths of the land wires are in Europe and America. All the submarine cables together give a length of 89,050 miles. The same journal asserts that the United States has a far larger number of subscribers to the telephonic exchange service than any other country in the world.

*** The funeral of Antonio Meucci, the friend of Garibaldi, took place last week at Clifton, S. I., from the old Garibaldi homestead at that place, various Italian societies from New York attending. The exterior of the house was decorated with the American and Italian colors. After a Masonic ceremony the Italian Consul made a short address, in which he spoke of the warm friendship that existed at one time between Garibaldi and Meucci, and referred to the many inventions of the deceased, the speaker claiming that Meucci was the first originator of the telephone.

With Care.

"Is this the telegraph office?"

"Yes, sir."

"Well, here's a telegram for my wife, but don't send it too quick, she's got heart disease."—*Evening Sun.*

The New England Telephone and Telegraph Company.

At a meeting of the directors of the New England Telephone and Telegraph Company, held October 23, a dividend of 75 cents per share was declared, payable on Friday, November 15, 1889, to stockholders of record at the close of business on Thursday, October 31, 1889. The transfer book will be closed from November 1 to November 14, 1889, both days included.

The following is a statement of business of the New England Company for quarter ending September 30, 1889:

Gross receipts for three months ending September 30, 1889	$326,180 92
Expenses for three months ending Sept. 30, 1889	225,790 19
Net earnings for three months ending September 30, 1889	100,390 73
Construction for three months ending September 30, 1889	56,960 14

The above figures would indicate that the company's business is steadily improving. President Sherwin and his competent staff are to be congratulated over the excellent result of their work.

The 'Phone in Europe.

What is undoubtedly the longest telephone circuit on the continent was opened to the public last week. The line is from Vienna, in Austria, to Leipsic, and every word can be perfectly understood and the voice recognized without difficulty.

The distance between the two cities by rail is something less than 300 miles, but the telephone wires, instead of being carried along the routes of the railways, where the noise of passing trains was found to interfere materially with the working of the long distance instruments, are strung along the high ways, where the results are found to be much better; and the actual distance on these routes is nearly 350 miles.

A strange fact has been noticed in connection with this route. While the speaker at Vienna is heard with remarkable clearness and accuracy at Leipsic and at all points along the route, as at Prague and Dresden, a speaker at either of these points is heard with much more difficulty at Vienna.

The electricians of the company are as yet unable to furnish a satisfactory explanation of this phenomena. Why sounds travelling from east to west should be clear and distinct, while those travelling in the other direction are more or less blurred, remains a puzzle.

GENERAL ELECTRICAL ITEMS.

The Thomson-Houston Electric Welding Company have made arrangements with the Secretary of the Navy to supply welding machines for the men-of-war.

It is estimated that the cost of an electric car equipped with motors, necessary gearing and two sets of batteries is about $5,000, according to the fineness of finish.

The Navy Department will, in a few days, issue specifications for equipping the steamship "Vermont," at the Brooklyn Navy Yard, with a commercial lighting plant.

Watch springs, piano strings and similar articles have been successfully tempered by electricity. The steel is wound on a spool, placed in an oil bath and by the electric current kept at the exact degree of redness necessary for the temper required.

J. H. B. Latrobe and others holding $30,000 stock of the Western Telegraph Company, of Baltimore, have sued the Western Union Telegraph Company to get control of 400 miles of wire along the Baltimore and Ohio road, from Baltimore to Wheeling.

Electricity, it is said, is now employed in India to prevent snakes from entering dwellings. Before all the doors and around the house two wires are laid, insulated from each other, and connected with an induction apparatus. When the snake attempts to enter the house he completes the circuit and is killed by the shock.

The cost of running street railways with horse-power and with electricity has been carefully estimated, and for the purpose of comparison a line running 50 cars is taken. Such a line, operated with horses, cost $303.75 per day, and with electricity, $68.50. The difference in favor of electricity is $231.25, or $4.62 per day saved on each car.

The French Minister of War is making some experiments in electric shooting, and intends to arrange so that he can discharge his guns upon the enemy from unexpected places by means of an electric current. By placing a battery on a hill, in a fort, or at the entrance of a defile, it would be possible to shoot from a distance or automatically discharge the artillery at any precise point of the line of defence.

M. Henri Pieper, of Liege, has just invented a new incandescent lamp of very simple construction. It consists of two horizontal rods of copper, placed about four millimetres apart. A thin pointed rod of carbon, placed vertically, rests on the copper rods and forms a bridge between them. The current passes between the copper rods through the carbon, which it renders incandescent. The copper rods are mounted on springs, which cause them to rise slightly when the carbon is totally consumed, and bring them against two contact pieces, thus preventing the rupture of the circuit.

Enzmann's Telephonic Relay and Langdon-Davies' Phonopore.

Mr. Enzmann, director of the Brazilian Telegraph Construction Works, employs for signaling longer or shorter emissions of rapid alternating currents. Such current emission comprises a larger or smaller number of undulations, according as it corresponds to a dash or a dot.

At the sending station Mr. Enzmann uses a special manipulator, provided with a contrivance which serves for the automatic interruption of the primary current. At the receiving station the alternating currents traverse the coils of a telephonic relay whose membrane registers the signals in a special apparatus. The telephonic relay can of course be employed with any registering apparatus, or else give sonorous Morse signals; the duration of these latter is regulated by the duration of alternating current emissions; it is short for a dot, and longer for a dash of the Morse alphabet.

Mr. Enzmann has been able to realize a considerable economy in the cost of batteries, for the current which they supply does not circulate in the telegraphic line, but only in a local circuit. The batteries, moreover, are utilized alternately for transmission and reception; in the former case they supply the primary current for the induction coil, and in the latter they only serve for the local Morse. This double utilization of one and the same battery is obtained by means of a simple switch.

With a battery consisting of two to eight large Meidinger cells, a current can be produced which, thanks to the great sensitiveness of the telephonic relay, gives very good Morse signals on a line of 160 to 300 ohms resistance. The sensitiveness of the telephonic relay also enables us to do without a translator, as we can telegraph directly even to long distances.

The installation of Morse stations would be very much simplified if at each station one line were reserved exclusively for transmission and another for reception. Since the two operations are not simultaneous, and the signals emitted by the sending station must be visible at the receiving end, the installation becomes a little more complicated.

The induction key must, therefore, satisfy the two following conditions: In the state of rest it must insert the telephonic relay in the telegraph line, but by depressing the lever the relay must be cut out of circuit at the same time that the secondary coil is inserted; on the other hand, the depressed lever must close the battery circuit, through the primary coil of the inductor, in order to permit the production of induction currents.

Fig. 1.

An ordinary key suffices for the solution of the first problem. We need only provide it with a movable brass lever *H* (Figs. 1 and 2), on a piece *m*; it is pressed against the contact *c* by a spring, and when depressed comes to lie against contact *a*. The two springs f_1 and f_2, screwed on the board, serve to close the circuit of battery *B* during transmission; *f* is slightly raised above f_2, and is beneath a screw *g* which perforates the lever, and whose lower extremity is provided with an insulated point.

When the lever *H* is depressed, it establishes contact between f_2 and f_1, and thus closes battery *B*; after this, *H* meets *a*, and thus closses the circuit for alternating currents. It need hardly be mentioned that the two closing manipulations must follow each other rapidly, or else we could not get a sufficient number of alternating currents entering line *L*. The induction coil *J* presents no particular features of interest. The current interruption is effected in the usual way by a Wagner hammer.

The telephonic relay *R* is represented in section and plan in Figs. 3 and 4. At the back is a horseshoe magnet *S* fixed by means of a screw *B*, and on which the core of the electro-magnet *M* is mounted. Opposite the poles of this latter an iron plate *Q* is arranged in such a manner as to enter into vibration when the coils of *M* are traversed by alternating currents. On the outside of the frame will be noticed a small arm *s*, forming an angle and turning easily round its axis. The extremity of this arm rests on the plate *Q* and oscillates with this latter. The contact between *s* and *Q* can be regulated at will by means of the small screw *q* provided with a screw nut. The contact is naturally less intimate during the vibrations than in a state of rest; consequently an electric current traversing *s* and *q* will be very much weakened during the vibrations of plate *Q*, *i. e.*, during the transmission of a series of alternating currents. All the points are platinized.

In addition to these apparatus and the Morse *X*, each station is provided with two brass strips *a*, having three terminals for fixing the conductors, and with a switch *U* whose arm rests on *g* during transmission of a message and on *N* during reception.

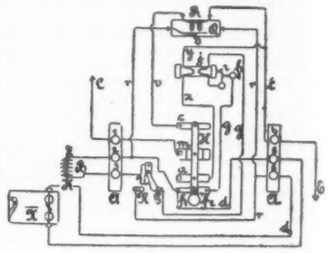


Fig. 2.

The connections are represented in Fig. 2, where it will be seen that the Morse *M* is inserted in the circuit *d*, *d*, and that a shunt *r*, *r* is established in which the lever *s* and plate *Q* are placed. The current strength in *d*, *d* is hereby increased, and this causes the apparatus *X* to write as long as the membrane of the relay vibrates.

The telegraphic transmission is as follows: At the sending station the arm of the switch *u* is on *g*. If the lever *H* is at rest the battery circuit is open because f_2 and f_1 do not touch;

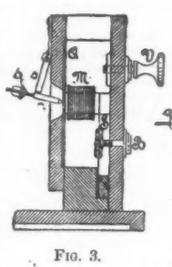


Fig. 3.

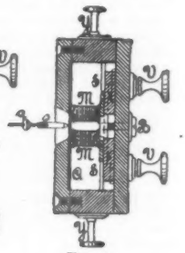


Fig. 4.

the current path in this case is from line *L* over 1, *m* and *c*, through the coils of relay *R*, and over *t* and 4 to earth.

If lever *H* is depressed the circuit of battery *B* is closed from the positive pole *K* over 3, *u*, *g*, the primary coil of inductor *I*, and through the automatic interrupter, *i*, *h*, over *g*, f_2, f_1, and 2, to the negative pole *Z*, and the automatic interrupter enters into action; but as soon as lever *H* touches contact *a* the inductor *I* sends alternating currents passing, on the one hand, through *x*, *a*, *m*, and *t* to line *L*, and, on the other, over *y*, *t*, and 4 to earth. The emission of alternating currents lasts as long as *H* remains in contact with *a*. As long as the arm *u* of the receiving station rests on *N* the battery *B* sends a local current partly through *dd* and *Z*, and partly through *n*, *q*, *s*, *r*. When the alternating currents arrive at this station they go from *L* over 1, *m*, *t*, and *v*, through the coils of relay *R*, and thence over *t* and 4 to earth; electro-magnet *M* now causes plate *Q* to vibrate, and thus diminishes the contact between *s* and *q*; the current passing through the Morse *X* is hereby considerably strengthened, and the apparatus traces an interrupted dash as long as *H* is depressed at the sending station. But *u* can also be allowed to remain on *g* at the receiving station.

In this case the apparatus *I t* naturally cannot act; on the other hand, however, relay *R* will act like a speaker, and the sounds emitted are of of the same duration as the emissions of alternating currents; consequently, *R* gives for a momentary depres-

sion of the key at the sending station a short sound corresponding to the dot of the Morse alphabet, and for a prolonged depression a sound of longer duration corresponding to a dash, so that the signals composed of these different sounds are as easily read as those written on a strip of paper; the reading by ear will certainly involve less trouble and less sustained attention than when the com-

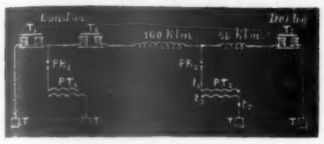


Fig. 1

mencement and the end of each signal are indicated by a noise in the telephone membrane.

Mr. Langdon-Davies' phonopore presents a certain external resemblance with Mr. Enzmann's apparatus. The aim of the inventor is likewise to utilize simultaneously the same line for ordinary telegraphy and telephony.

This system differs from Mr. Van Rysselberghe's chiefly by the receiver, and the principal drawback of this latter, the graduating electro-magnets, no longer exist. Further, instead of ordinary condensers, Mr. Davis uses a special apparatus, *the phonopore*, which consists in principle simply of two insulated wires coiled side by side.

Fig. 1 represents the application of the phonopore to the line London—Derby; as will be seen, the phonoporic apparatus are placed in derivation on the line; one of the stations was at a distance of 48 km. from a telegraph office, the other on a shunt between two offices. $P R_1$ and $P R_2$ represent the phonopore receivers, and $P T_1$ and $P T_2$ the transmitters we are going to describe; the shunts being connected to earth only through the intermediary of phonopores, the

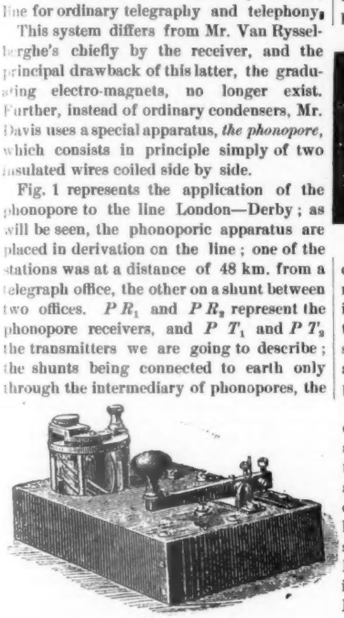


Fig. 2.

current from the telegraphic apparatus passes directly to line only producing a charge of these sorts of condensers, a charge which is without effect on the phonopore receivers.

Fig 2 represents in detail the phonopore station of the left extremity, T_1 being a sounder or a relay.

The phonopore transmitter $T P$ consists principally of a special electro-magnet with three windings; the first, which is in a circuit formed of the key K, a battery P, and a vibrating reed R, consists of a large number of convolutions of fine wire connected in parallel. This arrangement is intended to diminish, as much as possible, the sparks of extra current at the moment of breaking the circuit; the various coils having different co-efficients of self-induction, part of these extra currents are discharged in the coils themselves.

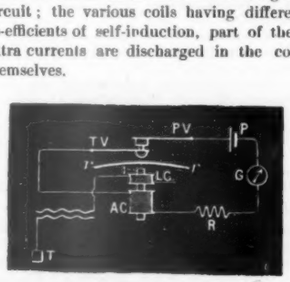


Fig. 3.

The secondary circuit of this induction coil consists of two wires insulated from one another and coiled side by side; one of the extremities of each of these remains free and insulated, the other extremity being connected respectively to earth and to line. It is this double insulated wire, forming a condenser which constitutes the phonopore.

When, therefore, the reed R vibrates with a certain speed, the electro-motive forces induced in the secondary circuit charge this sort of condenser, and give rise to a series of electric impulses in the line. The currents are naturally too weak, and alternate too rapidly to be able to influence the ordinary receivers. The receiver or transformer is likewise represented in Fig. 2; it consists of an apparatus sensitive to phonopore currents, which, when actuated, breaks the circuit of a battery P, and of a relay and its armature, which by breaking the circuit of a single local battery actuates an ordinary speaker.

The details of the receiver or transformer are shown in Fig. 3. It consists of an electro-magnet whose core I is continually excited by a battery P in circuit with coil $A C$, a relay and two interrupters $T V$ and $P V$, to which we shall refer further on.

On the same core I is mounted a second core $I C$, which forms part of the phonopore line and receives the electric impulses sent from the other station. Under their influence a membrane or reed of iron rr, whose proper period of vibration is the same as that

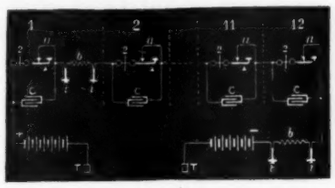


Fig 4.

of the vibrating transmitter, and which is maintained, attracted by the core I, is thrown into vibration and comes to touch the contact $T V$; a sort of hammer is pushed aside, so that the contact between the two presents a great resistance, as is the case in certain phonic calls.

The current, therefore, decreases in the circuit of relay R, the core I being less strongly magnetized exerts less attraction on the reed r, which comes to strike forcibly against the contacts $T V$, $P V$ and breaks the circuit; the armature of the relay is no longer attracted and the local circuit of the speaker is closed, the latter giving a signal. Fig. 4 represents the apparatus of the sending station. The speed of transmission with Mr. Langdon-Davies' apparatus is said to be very considerable.

The American Electrical Engineers Abroad.

During the recent visit of the American engineers to Europe, in connection with the Paris Exposition, they were the recipients of many flattering attentions, one of the most notable of which was the banquet given in their honor, at the Guild Hall, by the Lord Mayor of London, on June 13. Among the speakers on that occasion was Prof. Elihu Thomson, president of the American Institute of Electrical Engineers, who responded for his profession. Mr. R. W. Pope, the secretary of the Institute, has now been kindly favored by Mr. J. Forrest, the Secretary of the English Institution of Civil Engineers, with a transcript of Prof. Thomson's pithy and graceful speech, which we now have the pleasure of printing below:

Prof. Elihu Thomson: My lords and gentlemen, it is my privilege, as the chief officer of a young, vigorous and growing organization, the American Institute of Electrical Engineers, to express its thanks for the opportunities and hospitalities which have been so freely and graciously extended to it by our English brethren. The electrical engineering profession is in fact a very recent extension, a division of engineering. I need not remind the eminent gentlemen here assembled, many of whom have been far better witnesses than myself of the fact, that scarcely more than 10 years ago the electrical engineer had no part or place in the activities of engineering. It is true that the telegraphic expert was in a somewhat restricted sense an electrical engineer. It is more true that we have with us one whose scientific and mathematical genius made the difficult problem of ocean telegraphing an engineering success, and whom, therefore, I am quite sure you will agree, may be called the father of electrical engineers. The name of Sir William Thomson, engineers in general will be prepared to honor as the great master who, in addition to his numerous labors, has given and continues to give the electrical engineer instruments which are as his rule and square and compasses. But in him also we find the type of the true scientist to whom all truth is of equal merit. I can say for the electrical engineers of America, as representing their Institute, that the present opportunity of uniting with the civil, mechanical and mining engineering professions in celebrating the present memorable occasion, and particularly in extending thanks for the most hospitable and gracious privileges so freely accorded to them in England, will be long remembered and cherished. We are glad of the harmonious relations thus so auspiciously established with those on this side of the Atlantic who are carrying on work similar to our own, the growth and extension of which relations cannot but have the most beneficial effects on the work itself, but must even become a factor in uniting our national interests for the general advancement of the human race. The work of the electrical engineer is in a field of constant expansion; much work has been done, far more remains to be done. It is difficult for those unacquainted with the nature of the problems presented in a field so new to realize to the full the hard-fought battle with difficulties and against obstacles resulting in the victories thus far achieved. It has been required of the electrical engineer that he unite the qualities of the mechanician, the chemist, the physicist and general technologist, with those of patience and tenacity of purpose. He has been, as it were, a pioneer in a new country, with rocks and fallen trees lying in his path. The materials of construction alone, with whose properties he must be acquainted, cover a vast range of available substances and manufactures. For confirmation of this all that is required is to inspect the stock-rooms of our largest electrical manufactories. Many materials before unknown to trade have been demanded in the work. The field of operation is wide. Electric metallurgy, telegraphy, telephony, arc lighting, incandescent lighting, motive power transmission and electric railways, electric welding, soldering and metal working, electric tanning, besides a host of other operations in which electricity plays a chief part, now afford scope for the activities of the electrical engineer. Who is to say where the growth and development will stop? Will we not light our houses by electricity, giving light without heat? Shall not the time come when we may burn our coal, produce electricity in efficient amount therefrom, and thus supplant steam engines for motive power and dynamos for electrical work? Shall not the great water powers be turned to account to propel our railway trains, to do our metal work, to light our streets and buildings, to run our factories, and to effect our chemical operations such as bleaching, tanning, and the others? Shall not we even store up power in substances possessing high chemical affinities which power may be let out or recovered at any time hereafter for the uses to which electricity is now applied? Shall we even dare to hope that electrical communication on the Atlantic may be maintained with our friends and dear ones ashore? I believe that these things and more lie in the path which the electrical engineer of to-day has but begun to tread. As one of the oldest and greatest of philosophers has said of man, "For who shall bring him to see what shall be after him," we can certainly set no limit of achievement in this new field; we have at last laid hold of the properties of the universal ether to do our work, and its universal character will no doubt be exemplified in its applications to such work. As a delicate controller, as a transmitter of ideas written or spoken, as a giant mover of masses, as a lantern bearer, as a storer and carrier of power, as the most powerful and yet most delicate chemical reagent, as a heating agent under perfect control, and in many other ways the ether has been called to do man's bidding, that wondrous agent which has place in nature co-extensive with nature itself. In these allusions to electrical work I cannot forget that to theoretical science in England, and to its great leaders, we owe much of the growth and development which have led to our beginning, feeble as it yet is, of an understanding of the nature of electric and magnetic phenomena. In conclusion, I join in the heartiest manner in the response to the toast in expressing for myself and the society which I represent a most thorough appreciation of the friendly spirit and kind wishes shown. (Cheers).

TELEGRAPHIC

.... The Signal Office has asked for proposals for 60 miles No. 9 telegraph wire, to be submitted before November 4th.

.... It is stated that a company has been formed to lay a cable from Marseilles to Buenos Ayres. It has a capital of 2,000,000 sterling, with interest guaranteed by the Argentine Government.

.... The Paw Paw, Toledo and South Haven Railway have been enjoined by the American Bell Telephone Company from using their telephone line for other purposes than train dispatching and official business.

.... At the annual meeting of the Edison Phonograph Toy Company, at Portland, Maine, officers were chosen as follows: Benjamin F. Stevens, R. M. Field, Otis R. Weld, Lowell C. Briggs, A. O. Tate, J. W. McIntosh, Daniel Weld. The treasurer is Daniel Weld, and counsel Clarence Hale.

.... The Lighthouse Board has awarded a contract to John M. Klein, of San Francisco, for 12,000 feet single conductor submarine cable, to be delivered at Astoria, Oregon, for $1,980. This cable is to be used to establish telegraphic communication with Tillamook Rock lighthouse.

.... Superintendent J. A. Brenner and Electrician Brown, of the southern division of the Western Union Telegraph Company at Augusta, are in Savannah, where they will have the office of the company remodeled and renovated. The work has begun, and a general changing around of the office equipments will be made.

.... At a meeting of the stockholders of the Columbia Phonograph Company held in Washington, October 21st, the following named were elected directors for the ensuing year: Benj. Durfee, Wm. Herbert Smith, Chapin Brown, A. Johns and E. D. Easton. The report of the directors congratulates the stockholders upon the payment of the first dividend ever declared by a talking-machine company.

.... Although a postal telegraph system has been in operation in England for so many years, it is only during the current month that facilities for telegraphing money have been afforded the country. Now in 18 of the large cities a money order can be telegraphed from or paid at the post office, but already there are complaints that no saving is effected by the new system. Telegraphing is such slow work in the old country, and the mail service is so exceptionally rapid, that a letter often beats a telegram in a fair race.

.... The Gould-Tisdale Revolving Semaphore Company, of Boston, Mass., has through Major D. T. Everts, of Utica, a stockholder, placed two of its signals on the Delaware, Lackawanna and Western Railroad near Utica. The signals are intended to prevent collisions between trains. One signal is situated on the curve where the road rounds the hill south of the canal branch, and the other is located near switches at the West Shore road. Both can be seen from either direction for a considerable distance.

.... The Department of State is officially informed that a law has been enacted by Chili, to take effect four months from August 30, 1889, abolishing import duties on machines and tools for the use of agriculture, mining, trades and industries; pipes or tubes composed of copper, bronze or iron, galvanized or ungalvanized, knees, joints, "Ts" and other such necessary articles; iron or steel wire, galvanized or ungalvanized, up to No. 14 inclusive, and copper wire, or insulating composition for transmission of electric currents; telephonic and telegraphic instruments, insulators, iron or steel posts and other special parts for telegraphs and telephones; iron or steel for the permanent way of steam or horse railways, and for portable railways, wheels, axles and felloes of iron or steel for railways, and the cars for portable railways and iron in plates.

* * The United States man-of-war "Chicago" has one of the most complete electrical plants of any war vessel afloat.

* * It is said that Beaver Falls, Pa., will have an electric railway 5¼ miles long and that a company has already been organized.

* * During the past week, a marked advance has been made toward the completion of the electric street car lines in Boston included in the Thomson-Houston contract.

* * The McKeesport National Tube Works has completed some very satisfactory tests of welding by electricity. They claim they will soon be enabled to weld the smallest and largest pipe by the introduction of electricity along the edges of the bent pipe.

* * The Hamilton Electric Street Railway Company, of Hamilton, Ohio, has taken possession of the property and road of the present street car company. Additional cars were put on and, until the council grants the franchise asked for, the present road will be operated.

* * Work has been commenced upon the construction of an electric plant for the street railway system of Bloomington, Ind., and Normal, embracing in all about 12 miles of track. The building of the power-house is under way. The house will be completed in 30 days, and the cars will be run by electricity by New Year's day.

* * The directors of the North Beach and Mission Railroad Company, of San Francisco, have decided to adopt the electric system upon their road. Ground has already been broken, with that purpose. It is expected that the road will be in operation next spring. The trolley system will be employed.

* * The Daft Company is putting one of its storage battery motor cars on Mount Prospect avenue, Newark, N. J., to replace the accommodation bob-tail car that has served the residents there for several years. The car was shipped from the works at Marion a week ago, but was first taken to Plainfield, where the manufacturers had contracted to have one in operation by September 1st.

* * Unquestionably it is in the operations of mining and the connected industries of metallurgy that electrical appliances are to play a part of great importance. Already the application of this power has been commenced most auspiciously. The advantages of adaptability have already become self-evident in connection with mining work. Advantageous locations for steam power plants in a mining country are infrequently convenient to the places where the power is to be applied, while, if water-power is available, it is rarely so situated as to be of use without some sort of power transmission. And even when steam or water-power are available directly for one or more operations, they cannot be made to descend the shaft wire or traverse the winding tunnel. The contrasts between attempts of transmission of power by a line of shafting or wire ropes and the simple copper wire which may be strung on trees, up hill and down, around sharp curves and over precipices at will, is so apparent that it must decide in favor of the electric method. The current at the surface may be used to do the drilling below, run the cars carrying ore along the drifts and tunnels to the hoisting shaft, do the hoisting, transport the ore wherever needed above ground, run the machinery of the milling or concentrating works, and transport the product to the nearest railway station, besides lighting the mine as brilliantly as the sun, while repairing the tools and machinery employed in each and every part of the establishment.

* * It is reported that the Boston and Revere electric railroad, from Winthrop Junction to Crescent Beach, Mass., cleared $3,500 above expenses in 75 days last summer.

* * During the three months ending September 30, 1889, the orders received in the railway department of the Thomson-Houston Company alone, not including lighting apparatus or motors for mining or stationary work, amounted to 608 motors with an aggregate horse-power of 8,455, and generators for railway work aggregating 4,710 horse-power. This is at the rate of 52,660 horse-power per year in railway motors and railway generators alone. During the first 15 days in October the railway orders have aggregated 170 motors (horse-power 2,550) and 1,200 generator horse-power or a total motor and generator horse-power of 3,750, which is at the rate of 90,000 horse-power per year.

* * The rapid transit electric railway which extends from the city line at Pittsburgh, Pa., on Mt. Oliver to Whitehall, connecting with the St. Clair electric railway, which runs from Mount Oliver to South Thirteenth and Carson streets, will have a new line over the Birmingham pike to South Eighteenth street, to Mary, to South Seventeenth, to Muriel, to South Tenth, across the Tenth street bridge to Second avenue, to connect with the Second avenue electric road to the exposition. The company has secured right of way over the bridge. A second new branch of the rapid transit electric road will be built from the city line to the Twenty-second street incline, and connect at the foot of the plane with another branch.

In Favor of the Electrical Accumulator Company.

The above company has just been granted an injunction against the Fourth Avenue Street Car Company and the Julien Electric Company, by Judge E. H. Lacombe. The electric cars on Fourth avenue are not running this week. The decision is as follows:

The question whether or not the battery plates used by the defendants are infringements of the first claim of complainant's (Faure) patent—as it stands after filing of the disclaimer—is to be determined in view of the construction given to that patent by Judge Coxe in the action brought by the complainant against the Julien Electric Company. Under that construction what Faure discovered was the application of the active layer "to the supports (electrodes, plates or grids) in the form of a paste, paint or cement, prior to their immersion in the battery fluid." After hearing the testimony as to the experiments of Brush, and the other proofs as to the prior state of the art, which are again presented on the present motion, Judge Coxe found that the invention was one of more than usual merit, and allowed plaintiff to file a disclaimer, which should save him what he discovered.

Defendant's plates have been made in either of three ways:

1st. By the use of an active material containing over 10 per cent of fluid. This they concede to be a paste and assert that they no longer use it.

2d. By mixing the dry powder with about two and a half per cent. of the fluid, and then applying the mixture to the plates or *grids* under hydraulic pressure. The mixture before application does not present the appearance of an ordinary paste, but when it is subjected to high pressure and the particles of the powder and of the fluid are thus extended or brought into closer contact, there ensues either molecular or chemical action which produces what is known as *setting*—the particles of the mixture adhering to each other and cohering to the grid. To the production of this action the fluid is apparently an indispensable agent; no other satisfactory reason for its use is shown.

Whether or not a mixture of dry powder with two and a half per cent. of fluid is a paste while in the mixing tub, it seems to be a true paste at the moment of application—its components are substances by whose combination a paste may be formed and such mixture acts as a paste does.

3d. Defendants also force an absolutely dry powder into the interstices of the grid by hydraulic pressure. While the particles of the powder, thus compacted together, are still in place the grid is moistened with the fluid, either by brushing it over or by applying it to a carpet saturated with the fluid, first one side and then the other being laid for a moment upon the carpet. Sometimes it is also dipped momentarily in a bath of the fluid. The result of these processes (or either of them) is a saturation of the powder; the percentage of fluid in the mixture thus formed is not stated, but it is probably considerably higher than the two and a half per cent. of the second mixture. The mixture thus formed on the grid hardens in a few seconds, apparently going through the same process of *setting* as when mixed in the other methods. The defendants claim that this last process is the same as that used by Brush in the experiments proved in the former case, and that, therefore, it is still open to them despite the affirmance of the first claim of Faure, as modified by the disclaimer. They contend that all Faure did, which Brush did not, was to mix his paste before he applied it to the plate at all. This, however, seems too narrow a construction of Judge Coxe's opinion. If that is all that Faure invented, is is difficult to see in what respect his discovery merited the encomiums passed upon it in the opinion. What Brush did was to immerse a plate coated with dry material not only into fluid, but into the very fluid in which it was forthwith and without removal therefrom, put to use as a battery plate. If such immersion of Brush's dry material in the battery fluid did not form a paste because the electrical action to which it was subjected prevented its setting (which is what complainant claims), Brush's experiments did not anticipate Faure, who did discover the use of paste. If such immersion of Brush's dry material did form a paste it was formed after and not before the immersion of the plate in the battery fluid. Complainant's patent, however, covers any case where the form in which the layer of active material is applied is that of a paint, paste or cement, the application of such paste, paint or cement being completed so as to leave the plates ready for use "prior to their immersion in the battery fluid." Whether the paste is compounded in the mixing tub or on the surface of the grid seems immaterial, if the paste, etc., is, in fact, formed and that process completed before immersion for battery purposes.

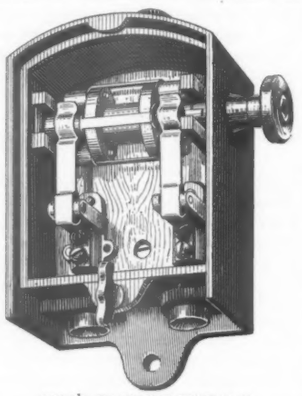
The Brush experiments, however, would no doubt cover the defendant's *fourth* method as described by their witnesses, viz: where a perfectly dry powder is compacted upon the grid by a hydraulic pressure, and no fluid is added until the plate goes into use in the battery.

Order accordingly.

October 25, 1889. E. HENRY LACOMBE.

Magazine Fuse Box.

A very ingenious device for renewing a safety fuse has been gotten up by Mr. W. S. Hill, of Boston, well known as an inventor and manufacturer of electrical apparatus of all kinds. The accompanying illustration shows the magazine fuse box, which must commend itself to every one who has attempted to replace a fuse metal while the current is on the circuit. The fuse boxes



HILL'S MAGAZINE FUSE BOX.

connected with the alternating system are usually placed outside the building and are oftentimes difficult to get at, and if a fuse is lost after the time for lighting up, it is not an agreeable duty to reach the box in the dark, especially on a stormy night, to remove the cover of the metal box and replace a fuse in the ordinary manner.

With this fuse box it is not necessary to touch the box or any of the metal parts; by turning the insulated knob one-fifth of a revolution, a new fuse metal is brought into circuit, and this can be repeated five times with one charging. The magazine consists of a pair of disks of insulating material mounted on a shaft, each disk having five brass screws with long projecting heads; the fuse metals span the space between the disks, and are secured by and in electrical contact with a screw in each disk. Two springs, which form a part of the circuit, bear on the heads of the screws so as to make a continuous circuit through the springs and the fuse metals. The springs are curved to conform to the screws so as to give a large contact surface.

The magazine is refilled by removing the cover of the box (the illustration shows the box without cover), then raising the springs to a perpendicular position, when the magazine can be removed and replaced by one that is full, and the empty one may be filled at leisure.

Exhibits at the American Street Railway Convention at Minneapolis.

On the ground floor next to the main exhibit hall the Short Electric Railway Company of Cleveland, Ohio, had on exhibition a Bemis truck equipped with two 15 h. p. Brush motors. The company claims that with their motors there is less wear on the gearing than in any system in use, owing to the size of the armatures which require a less number of revolutions to reach the desired speed. The motor fields are incased in sheets of copper to prevent the discharge of static electricity. The controlling stand is in connection with the motors by means of wire cables which operate a reverse lever that controls the brushes. The trolley, which is a great feature of this system, is on a revolving base and has sliding contacts throughout. In the sliding shoe which makes the contact with the overhead wire a "wearing strip" is placed which, when worn out, can be replaced at the cost of three cents and will stand the wear for 1,000 miles. Every motor is equipped with the patent wooden web noiseless gearing, a long life of which is guaranteed by the company.

In the rear of the base ball grounds, about two blocks from the West hotel, the Sprague Motor Company had caused to be built a short piece of track on which was placed a 16 foot narrow gauge car which was equipped with two 15 h. p. Sprague motors.

The car was built by the Pullman Palace Car Company, and is one of a number that is to be shipped to the Tacoma Railway and Motor Company, of Tacoma, Wash., where the Sprague system will be used.

The above was in operation during the Convention, and demonstrated the many superior points electricity possesses over all other power.

The St. Charles Car Company exhibited one of their cars on a short track built for that purpose in front of the hotel. In design and finish this car was the acme of perfection, finished inside with carved mahogany and with all modern improvements, and was greatly admired by all.

The Adams & Westlake Company, of Chicago, Ill., occupied a space in the Exhibit Hall, in which was shown headlights, center lamps and gongs for electric cars.

A large number of railway men, accompanied by Sprague representatives, took a trip from Minneapolis to Stillwater with the intention of inspecting the Sprague railway at that point. In many respects the road is truly a wonder, as the grades are numerous and great, one in particular that has a raise of 200 feet in 2,300. Seven cars are operated on this line, which is five miles in length. In the past it has been found impossible to operate a horse car line over this same territory successfully, but the successful operation of the electric line demonstrates the fact that it can be used under most any conditions. In view of the above, much wonder and admiration was expressed when the cars went up the steepest grades so easily. It is a fact worthy of note, that the same style of motors are used on this road that are used in a certain Southwestern city where, it is claimed, that electric railways are not a success.

STREET RAILWAY CONVENTION NOTES.

The Short Electric Railway Company entertained visitors in the reception room on ground floor.

The Sprague Electric Company headquarters were on parlor floor.

The Thomson-Houston Company were represented by T. P. Bailey, Chicago; F. C. Todd, St. Paul; and Norman McCarty, of Boston, with headquarters in Room 114, parlor floor.

Mr. J. H. Shay, of the Munson Belting Company, was at the West during the Convention.

G. C. Bailey, representing Jno. A. Roebling's Sons Company, spent the week at the West.

Wm. Hazelton, of Chadborne & Hazelton, Philadelphia, Pa., was among the Sprague representatives.

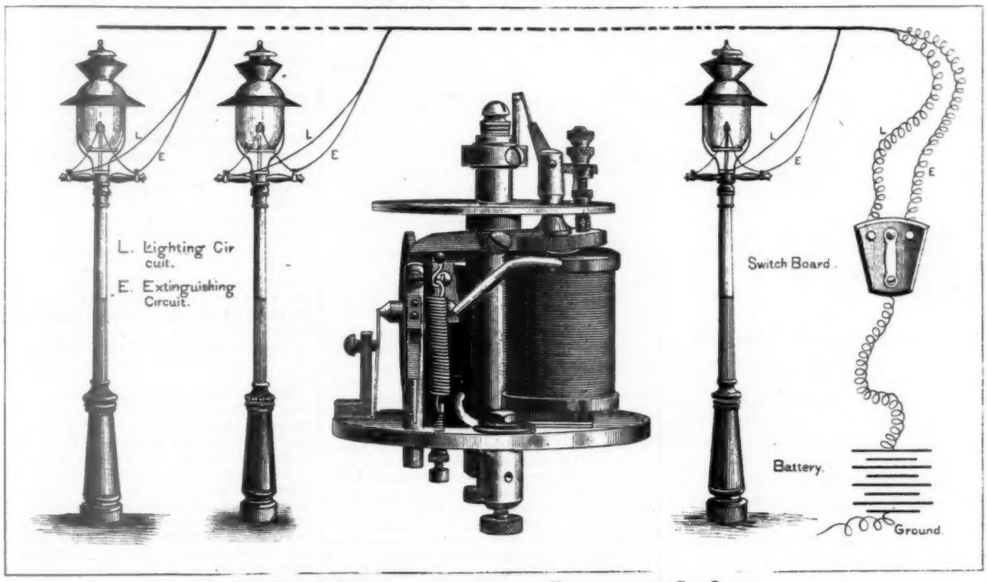
Mr. S. Mitchell, representing the Northwestern Electric Supply and Construction Company, of Seattle, was present.

—— The Duluth Electric Company, Duluth, Minn., have ordered two new incandescent dynamos, each capable of furnishing 500 lamps. This addition will bring the total number of incandescent dynamos up to five, with a capacity for 2,500 lamps. The company has 200 arc lamps, light for which is supplied by seven dynamos. The great demand for electric light in Duluth has made it necessary for the company to extend its station 40 feet on the west end, thus nearly doubling its room. Earth is being excavated for two new boilers, 65x18, which have recently been purchased. They are of Otis steel, have Butman settings and are exact duplicates of those in the Imperial mill. This will bring the total number of boilers up to five. Two large engines will be needed in addition to the two now used, but a decision as to the make has not been reached.

Universal Gas Lighting Company.

The system of the Universal Gas Lighting Company, as shown in the accompanying cut, is an exceedingly simple one, requiring no *specialized* apparatus except the burner itself. One side of the battery or source of power is grounded, and the other terminal carried any distance to a convenient switching station. From this, as shown by the cut, run out for each circuit of burners two wires, which may be separated or joined as a double insulated conductor. The one wire is for turning on and lighting the gas and the other for extinguishing. By an automatic arrangement in the burners themselves, they can be on but one of the circuits at a time, and as soon as the gas is lighted they become disconnected from the lighting circuit entirely and are thrown over on the circuit for extinguishing, and the same happens *vice versa* when the burners are extinguished. In this the burners are perfectly independent of each other, being joined in multiple, and should any injury be received by one the others would not be affected. If any burner should fail to work it would be immediately evident at the switching station, for upon breaking the circuit at the switch, there would be a slight spark, and the presence of the spark prove that all the burners have not turned themselves off from that circuit and on to the other. The number of burners that may be placed upon one circuit is only limited by the number of amperes given by the source of current. But experience and economy of plant seem to indicate that the best arrangement is in circuits of about 50 burners each. If there are a number of circuits in this way coming into the switching station, the battery circuit can be thrown upon first one and then the other of these in rapid succession, as the current is only needed for about 30 seconds on any one circuit, so that the question of time is not important.

The burner itself is constructed upon the most proper mechanical principles, and is the result of nearly a year of thorough practical testing and experimenting. The only spring parts are those shown in the cut, and the brushes of the commutator. The latter are made of spring silver, and the upper spring shown in the cut is of the same material, so as to provide against any deleterious effects of the matter or change of temperature. The coils are waterproof, and all connections are thoroughly insulated with mica and rubber or fibre. The gas-valve is a taper valve which will thus be always tight; and throughout the burner is made of the best materials.



THE DOWN'S METHOD OF LIGHTING AND EXTINGUISHING GAS LAMPS.

The Thomson-Houston Purchase of the Brush Company.

The Boston *News Bureau*, in its financial circular, has the following concerning these two great companies:

"The Thomson-Houston experts have returned from an examination of the property of the Brush Electric Company, of Cleveland, O., which was found to be much more valuable, and its affairs in a more prosperous condition, than had been supposed. It has a large number of unfilled orders and is running its factory extra time.

"Its mining department is exceedingly active, the large and successful installation at the Calumet & Hecla mine having been followed by extensive contracts in other directions. There is a demand from all over the country for the new long distance incandescent system lately perfected by Mr. Brush. The real estate of the company, consisting of seven acres of land and extensive buildings located in a populous part of the city of Cleveland, is believed to be worth a very large percentage of the cost of the whole property.

"The company owns the largest and most valuable carbon works in the world, and being already engaged in the manufacture of railway apparatus, will be of great assistance in the railway work of the Thomson-Houston Company, in which the latter company is now about six months behind its orders."

The Electric Light Plant at Haverhill, Mass.

Mr. L. H. Rogers, the New England representative of the Brush Electric Company, reports the securing of an important lighting contract in the vicinity of Boston. About five years ago the Thomson-Houston Electric Company organized a company and installed apparatus in Haverhill, Mass. The Haverhill Company was run under the auspices of the Thomson-Houston Electric Company for a few years, until they sold out to local capitalists in Haverhill.

During the early summer of the present year it was decided to purchase alternating apparatus to meet the demands of their growing business. A committee was appointed by the board of directors to investigate the different alternating systems.

Mr. Rogers has just succeeded in securing a business contract at a fair price, and a 1,000-light new Brush alternating dynamo will be installed in the Haverhill Electric Light Company's station immediately.

This is a great victory for the new Brush alternater, and its future success seems assured. A number of purchasers in and around Boston are waiting for the arrival of this new Brush machine in order to see if the claims made for it can be fulfilled. As Charles F. Brush has a reputation of never having produced an imperfect machine or piece of apparatus, the new alternater will, without doubt, be equal to all the claims made for it.

Mr. Rogers promises quite a time at Haverhill when the new dynamo starts up, and a detailed account will then be given.

In Preparation.

"Looking Ahead; and How to Get There," is a new work by Allen R. Foote, author of "Economic Value of Electric Light and Power." It is a philosophical discussion of economic principles for the guidance of the readers of "Looking Backward," and will be issued soon.

—— The Queen City Electric Light Company, of Gadsen, Ala., write us that they hung an incandescent lamp (Sawyer-Man make) above an engine July 4, 1888, which has been in use regularly every night since, 468 nights in all, averaging 12 hours a night, which equals, up to October 15th, 5,616 hours. The lamp, our correspondent states, still gives a good light.

—— Work has commenced on the electric light plant at Eufaula, Ala., and will be pushed to an early completion.

—— It is expected that the Rockville (Conn.) Electric Light Company will have their machinery in place and lights in operation in about six weeks.

—— The Brooklyn Electric Light and Power Company, Brooklyn, N. Y., which has secured the contract for the placing of their lights on all the elevated lines of railroad in that city, have commenced operations on the Broadway line.

—— The New Bedford Gas Light Company, of New Bedford, Mass., has installed a new 50-light arc dynamo and has a 500 incandescent light dynamo. The two electric light companies in that city are doing a very large business and competition is so sharp between them that they may in a short time consolidate.

—— Favorable progress is being made in the construction of the electric light plant of the Vermont Marble Company, at West Rutland, Vt., and the workmen are now engaged in wiring the quarries. This is somewhat slow, as it is difficult to select just the right location for the lights not only to light the most surface, but so they will not be in danger of being shattered when the rock is blasted.

—— The White River State Company, of Clarendon, Ark., proposes putting in an electric light plant for their works.

—— The Electric Light Company, South Bend, Ind., have ordered new machinery preparatory to the extensive lighting of the city.

—— Incandescent electric lights are popular in Macon, Ga. Manager Watson, of the Thomson-Houston electric light station reports that the demand is growing and that there are now orders for 300 more lights than the plant can supply.

—— The Thomson-Houston Electric Company reports the following sales of arc apparatus: Fremont, Ohio, 50; Portsmouth, N. H., 30; Grand Rapids, Mich., 50; Rutland, Vt., 35; Belle Plaine, Iowa, 20; Johnstown, Pa., 100; Watertown, Wis., 50; Woburn, Mass., 50; Chicago, Ill., 50; Chelsea, Mass., 50; Ft. Scott, Kansas, 70; Dayton, Ohio, 50; Mason City, Iowa, 35; Jersey City, N. J., 200; Germantown, Pa., 50; Worcester, Mass., 50; Philadelphia, Pa., U. S. Co., 50; Rome, N. Y., 50.

—— The increase of the number of electric light plants in towns and cities along both shores of the Hudson River is rapidly making the river at night a brightly illuminated marine highway, and pilots of steamboats of the night lines are well pleased with the situation. When the clouds run high on a cloudy night you can see the reflections from the towns and cities lighted by the electric lights fully 16 miles. Yonkers is only 17 miles from New York, and the sight is very clear between the two places.

ELECTRIC LIGHT NEWS

—— The Anniston Gas and Light Company, of Anniston, Ala., will have its new system of electric lighting in operation at an early date.

—— The Standard Electric Light Company, of Whitefield, Vt., are putting in a 100-light machine and incandescent lights for the Browns Lumber Company.

—— The contest over the public lighting of Lynchburg, Va., resulted in the award of the contract to the Schuyler Company for 200 arc lamps at 26 cents each per night.

—— The new electric light works are now in successful operation in Lee, Mass., and the light gives excellent satisfaction, the change from the old kerosene street lamps being especially noticeable.

—— Camden, Ark., is to have a very complete system of arc and incandescent electric lights, operated by the Thomson-Houston Company. The contract has been signed and makes provision to have lights in operation by December 15th.

—— In the hotel Bernina, at Samaden, which is completely fitted up with electric light appliances, the cooking of the establishment is now frequently carried on by means of electrical currents.

—— The Louisiana Electric Light and Power Company, New Orleans, has reorganized, and its plant will be greatly enlarged. Work on improvements will commence at once. The Fort Wayne Jenney Electric Light Company, of Fort Wayne, Ind., will furnish the machinery.

—— The city council of Harrodsburg, Ky., has accepted the proposition of the Harrodsburg Electric Light Company to furnish that town with light for a term of 10 years at $1,200 per year. The company will furnish the town with 60 lights, each 25 candle-power, at $20 per light, and agree to furnish others at the same price as they are needed.

—— The electric light company at Turner's Falls, Mass., has ordered a Thomson-Houston dynamo for incandescent lights to be introduced. The power to run it will be furnished by the wheel set by the Turner's Falls Company for the present arc lights, while power for the latter will be furnished by the Montague mill.

—— Some of the citizens of Chicopee, Mass., are agitating the question of lighting the Connecticut River bridge by means of electricity. The Chicopee River bridge is now lighted with gas, but that is not entirely satisfactory, and electric lights may be substituted. The Connecticut River bridge is about a quarter of a mile long and is a covered bridge.

—— The new boiler for the Manchester Electric Light Company, Manchester, Conn., has arrived, with those they had before making over 600 horse-power. The company have arranged for an alternating dynamo for incandescent lighting that will supply 1,000 lamps, which will be set at once in readiness for operation on the arrival of their new 500 horse-power compound engine.

—— Barnesville, Ohio, is to have the electric light, a contract having been agreed on with the Fort Wayne Electric Company. The Slattery induction system of this company will be used. The *Enterprise*, of that city, makes the excellent suggestion that the gas company there purchase the plant and run it in connection with the other illuminant. The wise gas man is he who realizes that his business is furnishing light and of the kind desired by the public. Col. F. O. Richards, of Lebanon, Ohio, represents the Fort Wayne Company in the above contract. Among the towns in Ohio that have lately put in this light are Salem, Lebanon, Pickaway, Letonia and Columbiana, and all are well pleased with it.

KINDRED INTERESTS

The Westinghouse Machine Company report the following among recent orders for compound engines: One 35 horse-power; three 50 horse-power; five 65 horse-power; two 100 horse-power; one 125 horse-power; seven 150 horse-power; seven 200 horse-power; one 250 horse-power. Total, 27 engines, aggregating 3,535 horse-power.

The Pond Engineering Co. are furnishing three 50 horse-power boilers for Kansas City, complete with Standard rocking grates, etc. They are supplying the Vine Street Electric Railway line, whose power plant they put in, with belting and a Tracy oil filter, and the Security Building, Kansas City, with the Pond Engineering Company's feed pump and receiver. The three-quarter million gallon pumping engine for Taylorville, Ill., has been set up and will be tested in a few days.

The American Electrical Works.—This popular wire manufacturing company, of Providence, has issued a beautiful specimen of the printer's art, accompanied by a Japanese talisman, which the friends who receive will be glad to have as a pocket piece. These lucky coins, it is stated, were secured through a Japanese friend who is in this country investigating electricity, and who got them from that famous magician, Ko-Ko. They are sent out with the wish on the part of the American Electrical Works that their magic power may increase in the possession of each honored recipient.

The Sprague Electric Railway and Motor Company report two new contracts closed during the last week for electric railway equipment in Nashville, Tenn. One of these is for the South Nashville Street Railway Company, and the other contracting street railway company is the Nashville and Edgefield Street Railway Company. Each of the contracts with these companies calls for the complete equipment of 10 cars, with the Sprague improved electric street railway motor, making a total of 20 cars which will be soon in operation in the city of Nashville upon the Sprague electric railway system. All the latest improvements and devices used by the Sprague Electric Railway and Motor Company upon their latest roads will be installed here, and the equipments will be first class in every respect.

The Thomson-Houston Electric Company, of Boston, during the past few weeks has completed the electrical equipment of a number of street railways, on which the electric cars are now in daily operation. Among them are the following:

	Cars.	Miles.
Central Railway, Peoria, Ill.	15	10
Citizens' Electric St. Ry., Decatur, Ill.	4	5
Metropolitan St. Ry., Kansas City, Mo.	4	5.40
Omaha Motor Ry., Omaha, Neb.	26	10
Ottumwa St. Ry., Ottumwa, Ill.	4	5
Quincy St. Ry., Quincy, Mass.	4	5
Richmond St. Ry., Richmond, Ind.	6	4

The company has also closed the following important contracts:

	Cars.	Miles.
Albany City Ry., Albany, N. Y.	32	14
City Elec. St. Ry., Nashville, Tenn.	6	3.61
Kearney St. Ry. Co., Kearney, Neb.	2	8
Macon City & Suburban Ry. Co., Macon, Ga.	4	4
Metropolitan St. Ry., Toronto, Ont.	2	3
St. Paul City Ry. Co., St. Paul, Minn.	20	51
St. Paul & Minneapolis Ry., St. Paul, Minn.	20	20
Union Depot Ry., St. Louis, Mo.	30	10

A contract has been recently closed for an electric railway at San Jose, Cal., which is the first Thomson-Houston road in the State. As one electric railway has already failed in this city, the selection of another was not made without careful investigation, which resulted in making the contract with the Thomson-Houston Electric Company. Ornamental double bracket iron poles will be used, and nothing will be left undone in making the road a model one in every respect.

The National Carbon Company.—The American International Congress, while in Cleveland, visited the works of the National Carbon Company, and were presented with a neat little souvenir prepared for the occasion, giving some interesting data concerning the manufacture of carbons.

W. R. Ostrander & Co.—This company has just issued their new illustrated catalogue describing their system of speaking tubes, electric call bells, burglar alarms, electric gas lighting apparatus, etc., a field with which they have been identified for many years. Their old factory was inadequate to meet the large demand for goods and has been enlarged, and they are now enabled to fill orders promptly.

The Westinghouse Machine Company report the following orders received in the month of August, 1889, viz:

23 Junior Engines	630 H. P.
35 Standard Westinghouse Engines	1,350 "
22 Automatic Compound Engines	2,055 "
80 Totals	4,035 "

Among the prominent buyers may be mentioned the following:

Omaha and Grant Smelting and Refining Co., Omaha, Neb.	65 H. P. Comp.
United Gas Improvement Co., Philadelphia, Pa.	80 " "
Allegheny County Light Co., Pittsburgh, Pa.	250 " "
Sawyer-Man Electric Co., New York, N. Y.	125 " "
Pocasset Manufacturing Co., Fall River, Mass.	125 " "
The Westinghouse Electric Co. (Limited), London, Eng.	250 " "
" "	150 " "
" "	65 " "
" "	50 " "
Denison Electric Light Co., Denison, Texas	2-100 " "
Henry C. Bowen Co., Providence, R. I.	50 " "
Electric Improvement Co., San Francisco, Cal.	2-100 " "
Marr Construction Co., Pittsburgh, Pa.	50 " "
Claus Spreckels, Philadelphia, Pa.:	
2-7½x 7 Standard,	50 H. P.
2-8½x 8 "	70 "
3-9½x 9 "	135 "
2-11 x10 "	130 "
3-12 x11 "	225 "
12	600 "
Safety Electric Light and Power Co., New York, N. Y.	35 H. P. Comp.
Colfax Electric Light and Power Co., Colfax, Washington Ter.	50 " "
East End Electric Light Co., Pittsburgh, Pa. 2-11 & 19x11	160 " "

Preliminary Injunction Granted.

Judge Lacombe, of the United States Circuit Court, has just rendered a decision in the case of The Electrical Accumulator Company against the Julien Electric Traction Company and the New York & Harlem Railroad Company upon a motion for a preliminary injunction to restrain the defendants from the use of a certain make of storage batteries in the electric cars now being run on Fourth and Madison avenues, in this city. The decision is in favor of the plaintiff.

It will be remembered that some months ago, in a suit brought by The Electrical Accumulator Company against the Julien Electric Company, Judge Coxe, of the United States Circuit Court, decided that the Faure storage battery patent exclusively controlled the application of the active matter in the form of a paste. Thereupon the Julien Electric Company began experiments for the application of the active matter in the form of a powder. As, however, the batteries in use on the electric cars have been made with the active matter applied in the form of a paste, Judge Lacombe has decided that the complainants are entitled to an injunction, but decides, at the same time, that the method employed by the defendants, of applying the active matter in the form of a powder before the plate is immersed in the electrolyte, is not an infringement, and that that method may be employed by the defendants.

* * Representatives of the Thomson-Houston Electric Company, of San Jose, Cal., have entered into a contract with the San Jose and Santa Clara Railway Company to construct and equip an overhead electric railway similar to the one now in operation at Washington, D. C. The work will be commenced at once and the line will be in operation in 90 days.

* * At a meeting of the San Leandro (Cal.) Board of Town Trustees, a few nights ago, a franchise was voted to John Landers for an electric street railroad. The franchise was granted for a term of 35 years, and on condition that in ten years the fare will e reduced from ten to five cents. The track will be of standard gauge, and the right was reserved to allow any other electric road the use of the track on Haywards avenue. The grantees are to furnish bonds in the sum of $5,000, and are to spend not less than $5,000 on the road within 12 months.

ELECTRICAL NEWS FROM LONDON.

ELECTRIC LIGHT STOCKS RISING IN VALUE—ELECTRIC TRACTION BY STORAGE BATTERIES—VOTING BY ELECTRICITY.

The great feature of the week as regards electrical interests has been the rapid rise in electric light shares and the very favorable notices which have been accorded to the companies in the various money articles of the investment advising press. There would appear to be every likelihood of these shares going to a heavy premium, and those whose patience have been tried for years may now expect to reap their reward. Swan United £5 shares which at the beginning of the present year with £3.10 paid up, stood at 2⅝ although no further call has been made, are now quoted at 5⅝ and once lately had risen to 6⅛, showing since January last a rise of over 100 per cent. The company I have referred to produce lamps and necessary fittings, and the increase in their business justifying the advance in the price of their shares, shows at once the greater activity of the supply companies necessitating the larger orders for electrical appliances. Attention may also be called to the Anglo-American Brush Company whose £5 shares, four-fifths paid, are now at 4¼—¾; the Metropolitan Electric Supply Company £2 paid are now 3¼—4, while in January although nominally at 1½—2 there was no dealing, and the London Electric Supply Corporation £5 paid, price now 4¾—5.

The Paris Exhibition awards have now been made public, but in examining the list of electrical industries it must be remembered that many of our chief firms were unrepresented. Gold medals were granted to Messrs. Crompton & Co., Limited; Crossley Bros., Limited; Clark, Muirhead & Company, Davey Paxman & Company, Eastern Telegraph Company, Greenwood & Batley, Ld., and the grand prize to Messrs. Elliott Bros. Silver medals were taken by Messrs. Paterson & Cooper, Henley's Telegraph Company, Ld., Davey Paxman & Company, (gold medal also), and the Electrical Power Storage Co., for their system of electrical supply for storage batteries (King's patents), as employed in Chelsea Electricity Supply Co. Messrs. Woodhouse & Rawson, Ld., were not represented in the English section, but were granted a bronze medal for the exhibits of their French branch.

Her Majesty, the Queen, has given her patronage to the Edinburgh Electrical Exhibition, and among others who have consented to act as patrons are the Duke of Buccleuch, Duke of Sutherland, Marquis of Tweeddale and the Earls of Aberdeen, Rosebery and Elgin. The Secretary of State for Scotland, the Marquis of Lothian, is president, and Mr. Edison is one of the vice-presidents. The prospectus which has now been issued states that the opening of the Forth Bridge, the greatest engineering work ever carried out, which is expected to take place in the spring of next year, is an occasion particularly favorable for the holding of an exhibition in Edinburgh, and is likely to be attended with the utmost success. A special provision is that of a lecture hall, in which popular lectures will be given explanatory of the principal exhibits, and will serve also for the meetings of the Institution of Electrical Engineers and other scientific bodies.

At Deptford, while great progress has been made, the arrangements are not yet completed. The 10,000 volt cables are now through and telephonic communications been made between the chief offices in Adelphi Terrace and Deptford. On Tuesday last the Society of Engineers visited the station, were entertained at luncheon by the directors, and then conducted over the works by Mr. Ferranti.

With regard to the Strand, which has been up for five weeks for the laying down of mains, *Money* states that according to Sir Coutts Lindsay, his company will now require to take up again to put down their mains. There is certainly very bad management somewhere, but every one disowns the responsibility.

The electric lighting of the Prince's Club, Knightsbridge, where the Prince of Wales is a frequent visitor, has been carried out by the United Electrical Engineering Company, under the direction of Mr. A. H. Vesey, who has now been requested by the committee to light the tennis and racquet courts, so that play can be carried on without a shadow being thrown upon the ball.

In South London further experiments are being made in electric traction with Mr. Jarman's car, which has been used for some two or three years. Mr. Jarman uses a double armature motor and accumulators, and has now nearly completed a vehicle which is much lighter in construction. The late experiments, according to the editor of our contemporary, the *Electrical Review*, were most successful, a larger distance being covered and various tests made to try the efficiency of the car. Mr. Jarman hopes before long to have six cars in daily operation, that being, in his opinion, the minimum number possible to work below the cost of horse traction. There is no doubt that if Mr. Jarman can only prove to the directors of one tramway company that his system is even as serviceable as the present mode, and more economical, the other companies will be only too ready to make use of it also.

A method, somewhat similar to that employed for marking the scores at billiards, is now under the consideration of the French Chamber of Deputies to simplify the process of taking divisions, in which, under present system, much time is wasted. M. Le Goazion has devised an electrical apparatus to be fixed in a box on desk in front of each member which is fitted with two handles, one to register "aye," the other "no," while should both be moved simultaneously it signifies the member does not desire to vote. The member can, however, within a certain period recall or correct his vote. The results are then exhibited on a receiver, and can be readily brought to a total. The idea is not claimed to be new, having been tried some years since in London, but it would certainly appear to be of practical utility in any public assembly where divisions are necessary and would save much valuable time.

You will learn with regret that Mr. Gisbert Kapp, the editor of our esteemed contemporary, *Industries*, has severed his connection with that journal this week, and intends starting in business as a consulting electrical engineer. His successor, at least in regard to electrical matters, is Mr. J. Swinburne than whom it would have been difficult to make a better choice.

Major Charles B. Waller, the manager and secretary of the London Electric Supply Corporation, Limited, writes that during last week current was transmitted from the Grosvenor Gallery station to the Deptford station with most satisfactory results. The offices in Adelphi Terrace, W. C., are supplied with the electric current from the Grosvenor station, the E. M. F. of 2,400 volts at which the current is supplied being reduced by transformation to 100 volts in the ordinary manner. The current of 100 volts was put into a transformer at the temporary distributing station at the offices, raised to 2,400 volts and then into other transformers, raising the E. M. F. to 5,000 volts, at which tension the current was passed through their cables direct to their Deptford station. The E.M.F. was then successfully reduced by transformation to 2,400 volts and to 100 volts, and at the latter working tension the works at Deptford were illuminated. The whole of the North Metropolitan Tramway Company at Canning Town is now worked by electricity, five accumulator cars of the Electric Traction Company being used, each carrying 52 passengers.

Messrs. Drake and Gorman have the contract for the lighting of the Devonshire Club, under the superintendence of Mr. F. Armitage, of Altrincham, and an endeavor is being made to obtain the effect of light in shade by a soft light from invisible lamps. Sir Henry Isaacs, one of the vice-presidents at the forthcoming Edinburgh Electrical Exhibition, has consented to act as president of the London committee formed for the purpose of interesting Londoners in the exhibition, and the executive chairman is Sir G. H. Grubb. The offices are at 3 Victoria street, Westminster. The committee of management for the electrical portion of the exhibition has now been formed as follows: A. R. Bennett, general manager, National Telephone Company; Principal Grant Ogilvie, Heriot-Watt College; Professor G. F. Armstrong, Edinburgh University; J. Gibson, superintending engineer, postal telegraphs; A. F. Clements, telegraph superintendent, the North British Railway; Dr. A. C. Elliott, Edinburgh University; D. A. Stevenson, engineer to Commissioners of Northern Lights; Colonel Malcolm, Royal Engineers; J. Monteith, Carstairs House; G. Auldjo Jamieson and Hugh Auld, the last three being gentlemen locally identified with electrical science progress.

It is now stated that during Mr. Edison's recent visit to London he declared he would shortly place on the market an incandescent lamp costing less than one half the price of those at present in use, and giving for the same expenditure of watts per candle-power 25 per cent. more light.

At a ball recently given by the officers of H. M S. "Excellent," at Portsmouth, to 600 guests, the ship was lighted with nearly 400 small incandescent lamps put up by the electrical staff of H. M. S. "Vernon."

Electrical Plant, our esteemed monthly contemporary has taken a large five storied warehouse at 39 Queen street, E. C., close to Southwark Bridge, which is now to be the chief office of the paper. In the basement there will be engines and accumulators, and their own gas engine to supply light; on the first floor, dynamos and motors; and on the remaining floors glass and arc lamps, switches and instruments, wire cables, belting, etc. As a purchaser will in this storehouse be able to inspect electrical goods of every description, and both new and second-hand, there is no doubt the proprietors, Messrs. Wheatly, Kirk, Price & Goulty, have supplied a long felt want, and deserve every success.

CHARLES FFRENCH.

London, October 12, 1889.

The Electric Lighting Situation in New York City.

To the Editor of Electrical Review:

The enclosed article was originally intended for your paper, but as I wished to bring the contents at once under the eyes of the misguided public, I concluded to send it to one of the daily papers; it was respectfully returned; another and a third was tried; they all refused its publication. One of them sent a polite note stating, as reason, that the article was in total opposition to the views advocated by his as well as by the other daily papers, but he added that he could not dispute my arguments as he considered them perfectly sound and correct, but that the daily papers had to be guided by the public feeling in the matter.

This proves that for editors who have chiefly been trained in the school of politics, the publication of correct information on different sides of a question is considered bad policy, and that truth is sacrificed if it is contrary to the prevailing prejudices of the public or party they serve, and which comprise their patrons—readers and advertisers.

P. H. Van der Weyde.

October 28, 1889.

The main cause of the late calamities is not so much in the high tension of the currents as in the multitude of wires which, being derived from several companies, cross and interlace one another. If it were possible to divide the city in electric districts and assign to every existing company the exclusive control of one of them, the main cause of danger to line men would be done away with. Or if in the existing conditions, the companies would for one hour out of 24, say from 12 M. to 1 P. M.; shut off their currents for the sake of protecting their employés, they would give their line men a chance to perform especially dangerous duties without risking their lives; or they might simply follow the example set by the water and gas companies who warn their customers when, for some reason or other, the supply was to be cut off, while the latter could be provided for, if warranted by the importance of having a steady supply, since science has provided the means of storing up electricity as easily as water is tapped before the supply is cut off.

The proposition is now discussed of limiting the potential of the current to 300 volts. Unfortunately this may kill as well as high voltage, if backed up by a quantity of current of a sufficient number of amperes. This was quite recently illustrated by the killing of a horse and almost the driver also, by the overhead current supplied for driving the electric street cars in Scranton, Pa., which current is conducted on a bare wire and derived from an Edison dynamo of 300 volts. It was at first asserted that the current came from the electric light wires, but this was disproved.

It is generally overlooked, even by experts, that the quantity of current (the amperes) enters fully as much in the question of danger as the electro-motive force (the voltage). The 10-inch spark of a Holtz electric machine will not kill, even not the 16-inch spark of a powerful Ruhmkorff induction coil, as I have proved in 1863 by experiments on the late and well-known Dr. Riddle, who kindly offered himself to be experimented upon; I had no hesitation, knowing that the intensity shown by the length of the spark amounts to nothing, and that those instruments are deficient in producing quantity of current; however, the discharge of the modern dynamo produces the combined electro-motive force and quantity both, and this is the source of danger connected therewith.

But assumed that a current of 300 volts is always safe, the principal question is then, if its use would be of practical advantage. The fact is, that it may do well enough for domestic illumination by incandescent lights of very low candle-power, as adopted by Edison, but is entirely insufficient for arc lights in the public streets; if such a law were passed, we might as well give up electric illumination of the streets, because we should be confined to incandescent lamps, of which the light is not stronger if not inferior to that of modern improved gas burners.

It may be supposed by some that a current of 300 volts may be used for arc lights, and so it may; but this use is so limited, and imposes such conditions as would make matters much worse than they are now, as it would compel the companies to stretch a far greater number of wires than at present. This I will explain: An arc light circuit of 2,700 volts, which is quite common, can supply 60 lamps over a circuit of five to eight miles; they give the required amount of 45 volts for each lamp, counting the resistance of the line equivalent to a few lamps. If we reduce the 2,700 volts to 300, we have only voltage enough for six or seven lamps, as this is all a 300-volt circuit can supply, as each lamp requires its 45 volts.

To furnish the required potential to 60 lamps they will require a circuit of 300 volts each, consequently nine times as many wires, and the number of wires proceeding from any station where now a tension of 1,000, 2,000 or 3,000 volts is used, would then have to be increased three, six or ten times, and any station in New York where now 100 wires proceed from (every circuit having two wires at the station) would be compelled to stretch 1,000 wires.

This would be a calamity of another kind, especially if we consider that even 300 volts are not safe, if backed up by a sufficient amount of current (amperes), as explained above. The infliction of multiplying the wires ten-fold, either above or underground, might lead us to abolish our so boasted of electric illumination and return to the old gas lamps, and by the comparative darkness encourage the criminal element, always very large in densely populated cities, which the bright arc lights enabled the police to keep better in check than formerly.

In regard to the statement, which has been going round the daily press, that currents higher than 300 volts are forbidden in Europe, in England, and especially in London, I wish to state that this is entirely erroneous; to the contrary, the high tension alternate currents are there more commonly used for street lighting than the direct currents, which, in the principal parts of London, such as around Regent street, are absent, except for incandescent lights, which are also provided by the alternate high tension currents modified by converters.

It is also well known that a powerful company has been formed in London, of which prominent Government officials are stockholders, with the intention of building a dynamo surpassing in size anything ever built on the continent of Europe, where there are already much larger dynamos in operation than any in this country.

This London dynamo in course of construction is built according to the Ferranti system, which is alternating. The steam engine itself is to be used as a dynamo, by transforming the fly-wheel of 44 feet in diameter in revolving field magnets, with an enormous high velocity at its circumference; by this device they expect to obtain a voltage of 10,000, and intending to reach in this manner the most distant parts of London, and to feed 1,000,000 incandescent lamps. They have now in operation two, not quite so large, dynamos built on the same principle.

Brooklyn, October 24, 1889. P. H. V.

Government Electric Work.

The following table gives the bids received by the Treasury Department last week, for combination electric and gas fixtures for public buildings at the places named. The successful bids are in italics:

	Schultz Fixture & Art Co., Baltimore.	Archer & Pan coast M'f'g Co., New York.	Hollins & Co., Boston.	Horn, R. & Forsyth M'f'g Co., Philadelphia.	E. Barrett, Chicago.	Bergmann & Co., New York.	W. C. Coburgh M'f'g Co., Brooklyn.	Oxley, G. & Sons, New York.	Mitchell-Vance Co., New York.	Thackara M'f'g Co., Philadelphia.	G. W. Walter, Baltimore.
Springfield, O.	$706.30	$942.00	$932.00	$831.55	*$783.50*	$1010.02	$1089.48	$1423.56			
Keokuk, Ia.	*1460.34*	1848.50	2050.00	1710.00	1744.50	1808.00	2231.00		$2855.75		
Augusta, Me.	*893.30*	1156.88	1218.75	1228.35	1064.00	1226.25			1792.00		
Des Moines, Ia.	*2376.85*	3084.95	3471.00	3056.95	2644.00	3247.82					
Santa Fe, N. M.	*1123.50*	1178.05	1349.50	1327.00	1463.00						
Ft. Smith, Ark.	1240.05	1391.33	1485.50	1332.00	*1236.25*	1458.91					
Ft. Scott, Kan.	*927.70*	987.90	1068.00	1068.05	1028.75	1055.30	1933.82	2056.44	1416.75		
Reading, Pa.	*909.70*	1086.20	1139.00	1019.00	1131.50	1249.99		1696.94			$1331.48
											$1279.25

— On account of increasing business the Rutland (Vt.) Electric Light Company has just purchased a new dynamo for 50 arc lights, and also a steam condenser.

The Aluminum Brass and Bronze Company and Its Staff.

Mr. Thomas L. Fowler, for the past 15 years connected with and for several years manager of the metal department of the Ansonia Brass and Copper Company, 19 Cliff street, N. Y., and Mr. F. G. Stone, who has had charge of the electrical department of the same company, have resigned to accept responsible positions with the Aluminum Brass and Bronze Company. Mr. Fowler assumes the position of general manager of the company, and will make his headquarters at 261 Broadway, and Mr. Stone will represent the company as general sales agent. The Aluminum Company is to be congratulated on securing the services of these capable and experienced gentlemen, and will enter the field well equipped for winning success. The officers of the company are F. J. Kingsbury, president and treasurer; F. J. Kingsbury, Jr., secretary; Dr. Leonard Waldo, electrical engineer, and Charles S. Morse, mechanical superintendent, and to the latter gentlemen, in a large measure, is to be attributed the most perfect factories and mills which have been constructed by this company at Bridgeport, Conn. The grounds of the company comprise nearly 10 acres, and the buildings cover about 80,000 square feet. Within the next 60 days all the departments of the company's mills and factories will be running. A large amount of silicon bronze wire has already been furnished for electric railway work, and castings for mining machinery, commutator bars, engines and gear wheels, are all being successfully turned out. The value of the Cowles aluminum alloys, the exclusive rights of which in the United States are owned by this company, is becoming more and more widely known. The present company is a progressive one, and is well equipped for supplying the demand which we predict will come from many directions.

— Ann Arbor, Mich., is investigating the cost of erecting and maintaining an electric plant for public lighting, to be owned and operated by the city.

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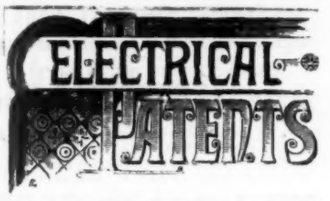

Index of Inventions for which Letters Patents of the United States were issued on October 16, 1889.

413,038 Electric meter; William H. Douglass, Stowbridge, County of Stafford, England.

413,058 Electrical toy; Ludwig Hirsch, New York, N. Y.

413,085 Electric motor; Francis J. Patten, New York, N. Y.

413,112 Electrode for secondary batteries; Henry Leidor, Luxemburg, Germany.

413,133 Coupling box for electrical conduits. 413,134 Method of making lateral connections in underground cables; Sylvester P. Denison, Brooklyn, N. Y., assignor to Geo. R. Thomson, Philadelphia, Pa.

413,136 Method of electric refrigeration; Mark W. Dewey, Syracuse, N. Y., assignor to the Dewey Corporation, same place.

413,146 Insulator; Louis McCarthy, Boston, Mass., assignor to Charles Lennant Lee, same place, and the Gould and Watson Company, of Massachusetts.

413,148 Dynamo electric machine; Gustav Pfaunkuche, Cleveland, Ohio.

413,151 Electric railway car; Frank J. Sprague, New York, N. Y., assignor to Sprague Electric Railway and Motor Company, same place.

October 23d, 1889.

413,160 Electric car lighting; Sydney H. Barrett, Springfield, Mass., assignor to Dwight Holland, same place.

413,215 Underground conduit; George H. Warde, New York, N. Y., assignor to William Hampden Johnstone, Philadelphia, Pa.

413,220 Holding attachment for arc lamps; Thomas H. Brady, New Britain, Conn.

413,276 Central station calling apparatus; Isaiah H. Farnham, Malden, Mass., assignor to New England Telegraph and Telephone Company, of New York.

413,279 Electric regulator. 413,280 Switch for dynamo-electric machines; William Hochhousen, Brooklyn, N. Y.

413,281 Electric pendulum-driven clock; Marcus L. M. Hussey, Menlo Park, N. J.

413,282 Phonograph; Wm. W. Jacques, Newton, Mass.

413,287 Contact trolley for electric railway cars; James Mitchell, Des Moines, Iowa.

413,292 Electric measuring instrument; Elihu Thomson, Lynn, Mass., assignor to Thomson-Houston Electric Company, of Connecticut.

413,293 System of electric distribution; Elihu Thomson and Edwin W. Rice, Jr., Lynn, Mass.

413,294 Conduit for electric railways; Elihu Thomson, Lynn, Mass.

413,308 Telephone receiver; Chas. Selden, Baltimore, Md.

413,337 Dynamo-electric machine. 413,338 Magnetic gauge for testing the magnetic conductivity of metals. 413,339 Secondary battery; Rudolf Eickemeyer, Yonkers, N. Y.

413,340 Electric regulator for pendulum clocks; James H. Gerry, Brooklyn, N. Y.

413,345 Galvanic battery compound; William P. Kookogey, Brooklyn, assignor to Kookogey Electric Company, New York, N. Y.

413,353 Method of obtaining direct from alternating currents; Nikola Tesla, New York, N. Y., assignor two-thirds to Alfred S. Brown, same place, and Chas. F. Peck, Englewood, N. J.

413,363 Dynamo-electric machine; Rudolf Eickemeyer, Yonkers, N. Y.

413,409 Railway train signal. 413,410 Electro-magnetic railway signal. 413,411 Electro-magnet. 413,412 Electrically operated railway switch; Daniel S. McElroy, New York, N. Y.

413,436 Electric signaling apparatus; William E. De Crow, Boston, Mass., assignor to the Gamewell Fire Alarm Telegraph Company, of New York.

413,442 Incandescent lamp; Emil F. Gennert, New York, N. Y., assignor to the E. P. Gleason Manufacturing Company, same place.

413,504 Annunciator; Frank E. Fisher, Detroit, Mich.

413,512 Electric switch; Robert G. Hull, Baltimore, Md.

413,604 Electric railway; Rudolph M. Hunter, Philadelphia, Pa., assignor by mesne assignments to the Thomson-Houston Electric Company, Boston, Mass.

413,636 Juan T. Van Gestel, New York, N. Y., assignor to the Van Gestel Electric Street Car Company, same place.

413,637 Electric railway system; Malone Wheless, Washington, D. C., assignor one-half to Samuel E. Wheatley, same place.

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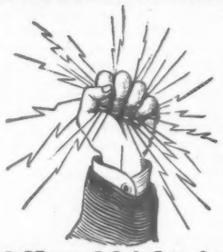

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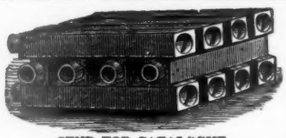

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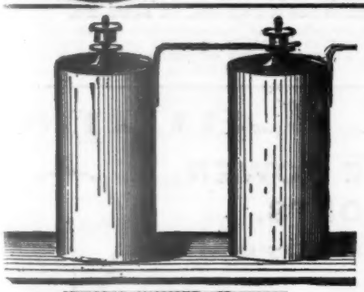

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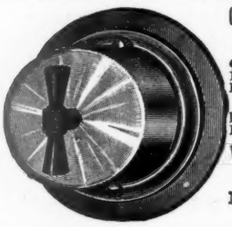

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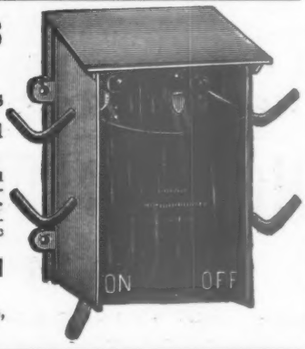

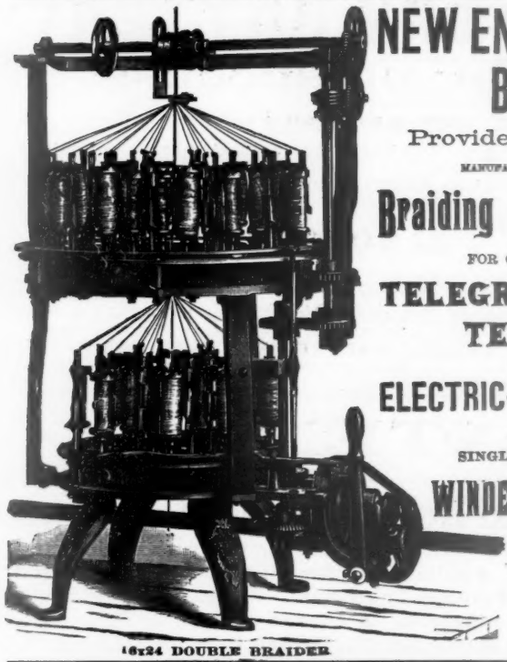

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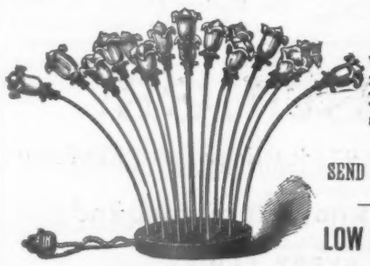

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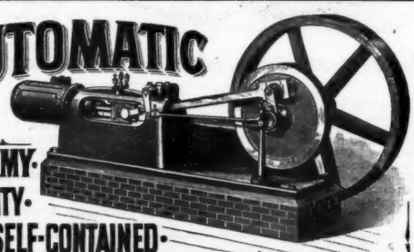

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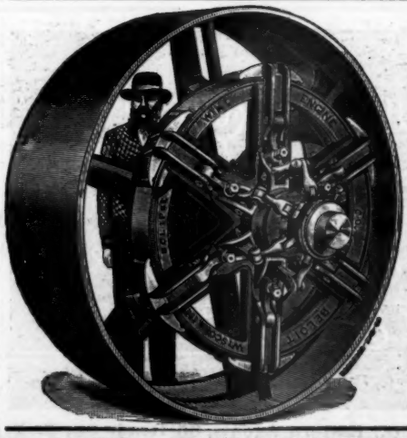

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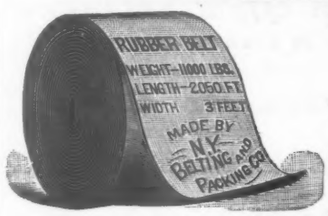

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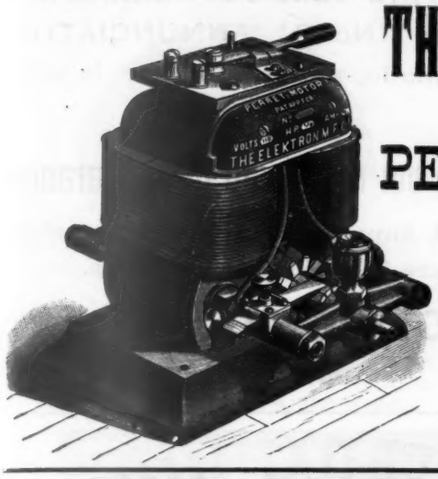

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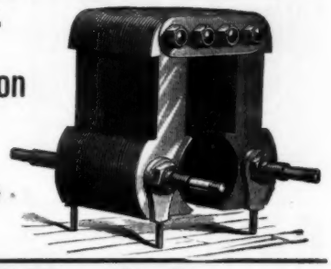

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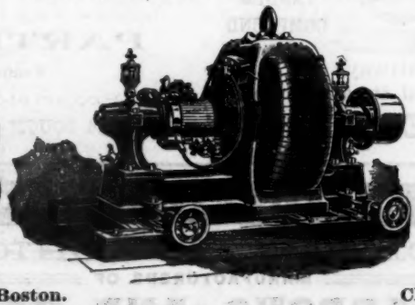

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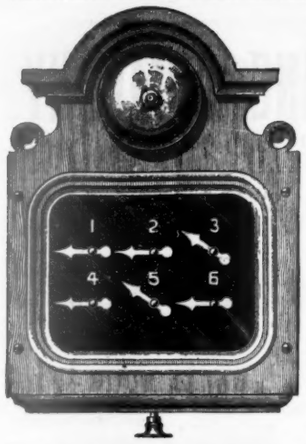

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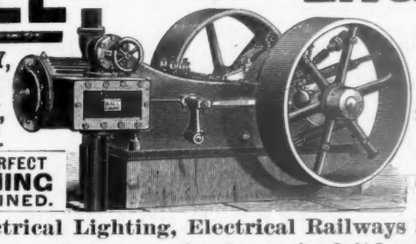

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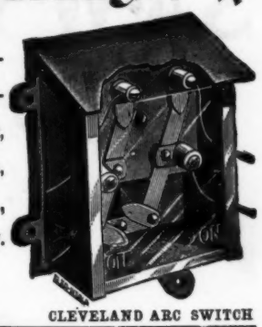
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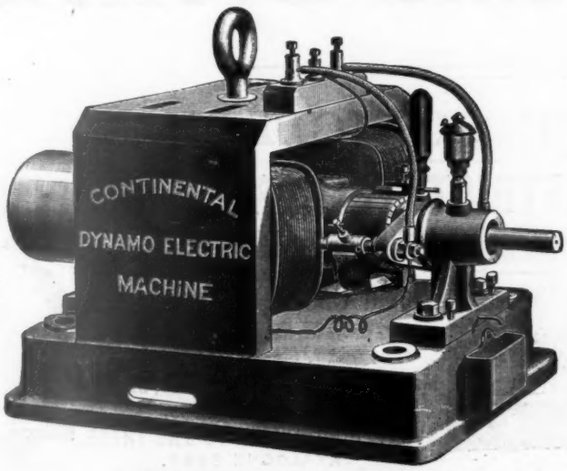

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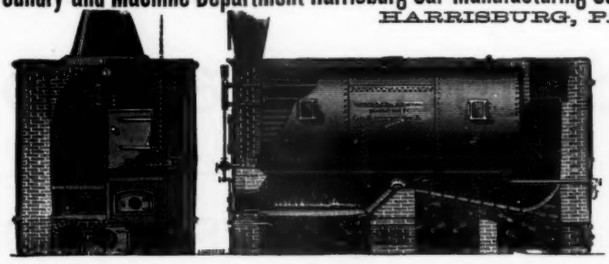

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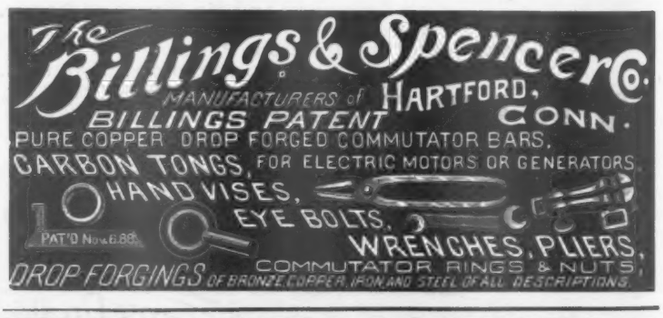
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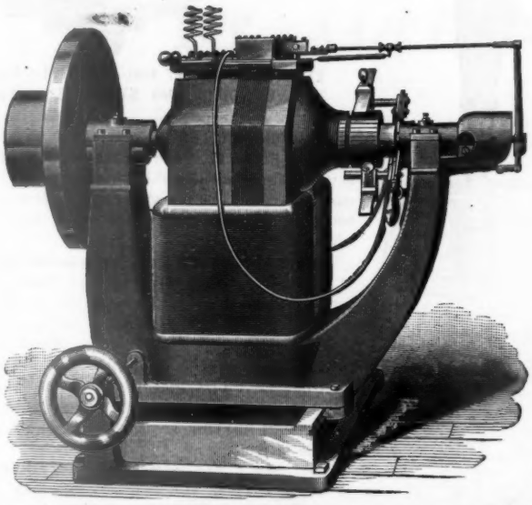

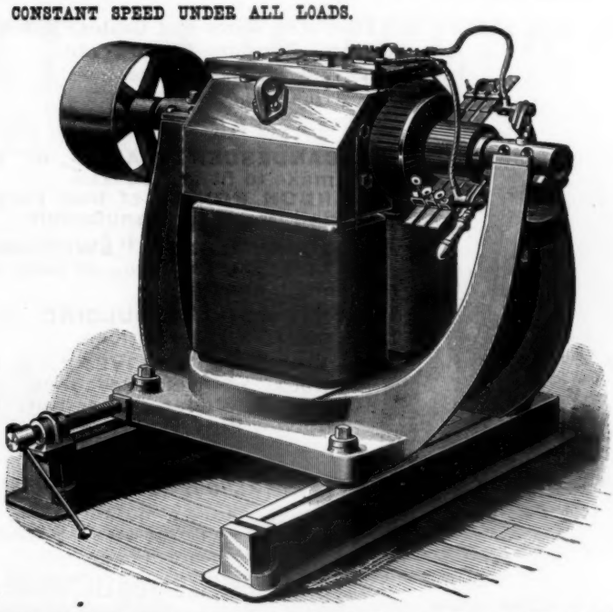

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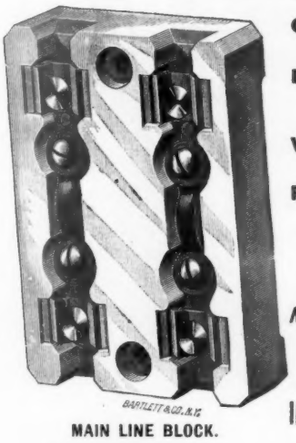

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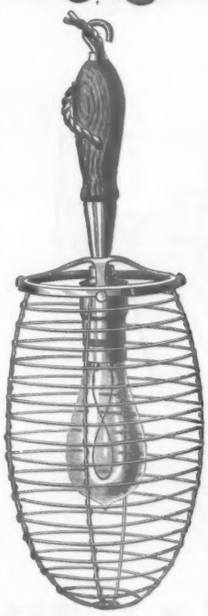

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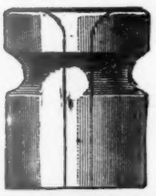

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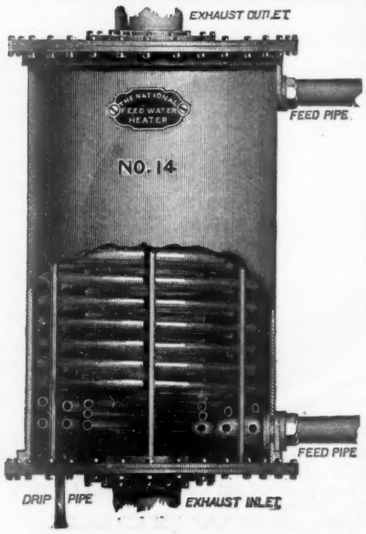

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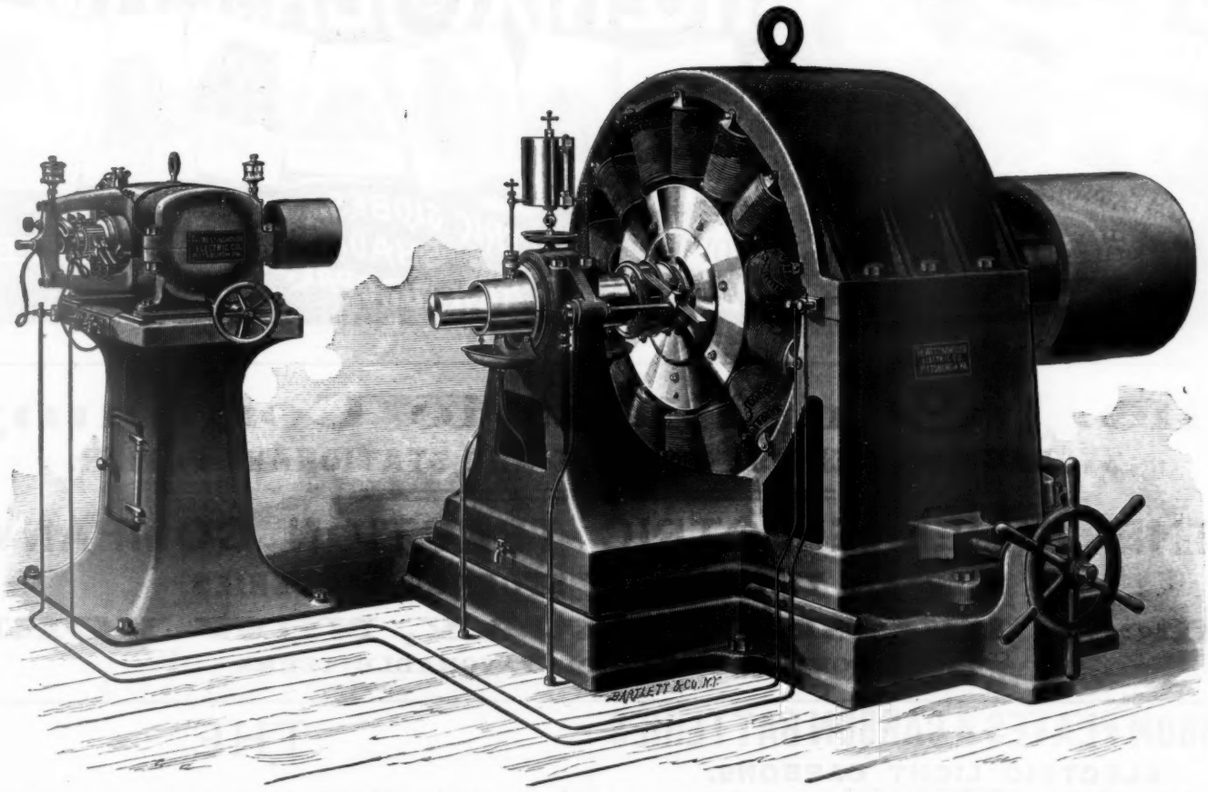

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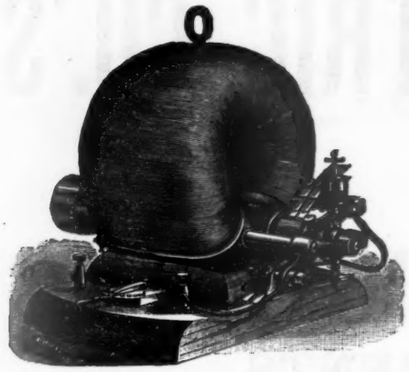

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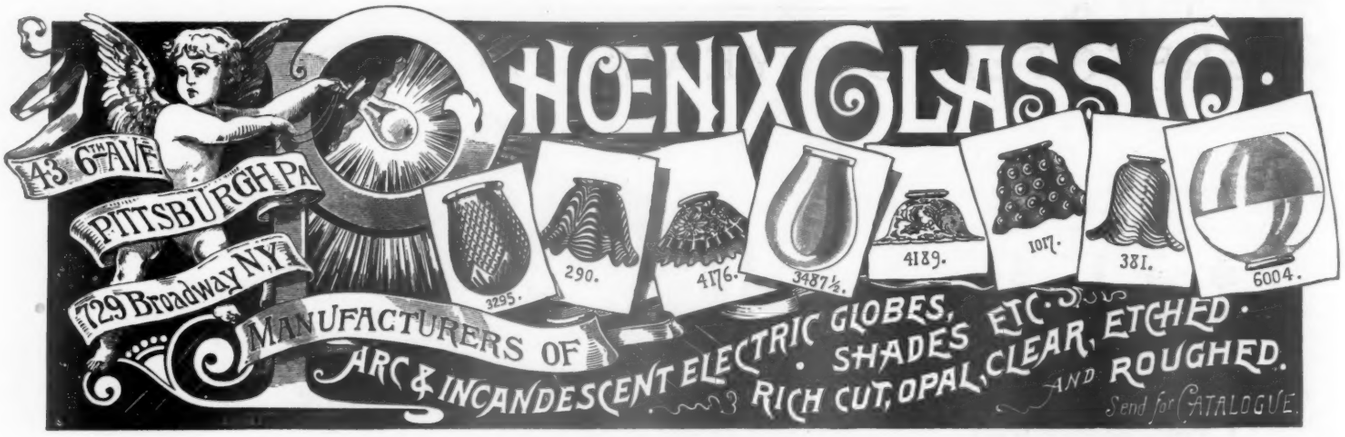

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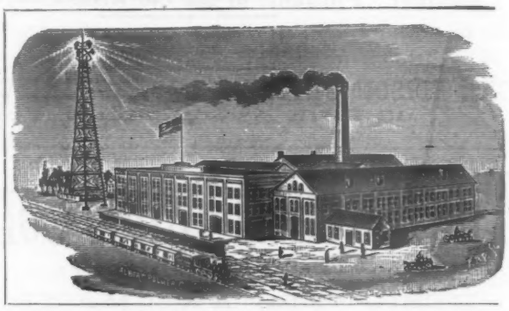

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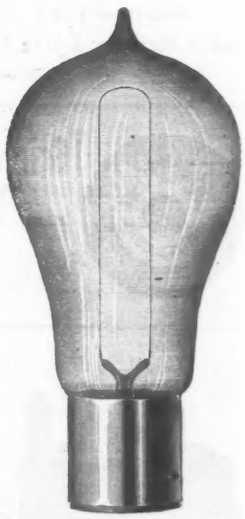

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